Foreword

Cotton is a major crop in the USSR, and Soviet cotton figures prominently in the world of cotton. In 3 of the past 6 years the USSR has led the world in cotton production. It also leads in cotton consumption. Because of the country's overall importance as a producer, the rate of recent expansion, and the lengthy period since Soviet cotton production was last studied by scientists of the U.S. Department of Agriculture, the current study arranged under the Scientific Exchange Program of our respective governments is most timely and welcome.

On behalf of the specialists who made up the U.S. cotton team, appreciation is expressed to the USSR Ministry of Agriculture, the ministries of agriculture of the republics visited, and the scientists and administrators at the various institutes, procurement centers, gins, and farms included in the study. The team is especially appreciative of the marked contribution made to the study by the extremely knowledgeable cotton specialist of the Ministry and the very capable intourist interpreter who accompanied the team while in the Soviet Union, and to the numerous individuals who worked on arrangements and prepared statistical data for the team.

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COTTON GROWING REPUBLICS OF THE SOVIET UNION

COTTON PRODUCTION IN THE SOVIET UNION
Report of a U.S. Team[1]

SUMMARY AND CONCLUSIONS

When the U.S. cotton production team visited the Soviet Union, the 1972 cotton harvest was in progress, and the crop was then estimated to be at least as large as the record 7.1 million metric tons of unginned or seed cotton harvested in 1971. This is equivalent to 10.9 million bales (480 lb. net). Actually, the crop turned out to be 7,296,000 tons—a new record—which is about 700,000 tons above the official production plan, and equivalent to about 11.2 million bales.

In 1973, the producing Republics are aiming at a crop of slightly over 7.3 million metric tons, some 500,000 tons above the 1973 plan level of 6.8 million tons. There were early reports of limited water availability and inclement weather in some areas, but as of late June there appeared to be no reason to doubt that the goal might well be achieved. In fact there was evidence that the difficulties to date were strengthening the determination at all levels to exert the extra effort to insure that production targets would be realized. Although cotton production has always been beset with serious problems in the USSR, this has not prevented that country from expanding its production to such an extent that, in 3 of the past 6 years, it has led the world in cotton production. It also leads in cotton consumption.

Among major problems faced by Soviet cotton production is the pressure for early maturing varieties of Upland and extra-long staple (ELS) cottons. The most southern cotton growing area in the Soviet Union is on about the same latitude as Fresno, Calif., and the northern boundaries of Arkansas and North Carolina. The northern areas of production are on about the same latitude as Boise, Idaho, Milwaukee, Wisconsin, and Buffalo, N.Y. These latter areas are well to the north of any other major cotton producing area in the world.

Verticillium wilt is another major problem in a number of important USSR cotton areas. Because of the seriousness of this disease, a high priority is given to cotton breeding and other research programs designed to develop wilt resistant varieties and cultural practices which facilitate successful production of cotton on wilt infested soils. Extensive areas also suffer as a result of soil salinity and in some cases a high water table.

Despite the enormity and severity of these major cotton problems, distinct progress in coping with them was reported. The comparatively new Tashkent 1, 2, and 3 varieties are represented as performing better on wilt infested soils than the older established previously grown varieties such as 108F. Improved drainage and other ameliorating practices are reducing soil salinity in the root growing zone and higher yields are reported.

New lands continue to be brought under irrigation and cotton is given a high priority for such land. Cotton also receives priority treatment in terms of fertilizer and water allotments.

Considering the amount and kinds of machinery that exist in cotton areas and the large amounts of labor used on cotton farms and in procurement centers and gins, the U.S. team noted the marked differences between labor use in the Soviet Union and the United States. The U.S. farmer or ginner gives close attention to his labor and power costs. Such appeared not to be the case on some of the farms visited in the Soviet Union where in addition to considerable power machinery, including mechanical cotton pickers, work brigades might be assigned at

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the rate of one full-time worker for each 5 to 10 acres of cotton. In some of the newer cotton areas where population is less dense—such as the Hungry Steppe—labor efficiency is considerably higher but still low by comparison with the United States.

Members of the U.S. cotton team were keenly aware of various aspects of cotton production in the Soviet Union that they would have liked to pursue in greater detail. This is not intended to criticize in any way the program that was developed for the team. It merely recognizes the importance of the USSR's cotton producing industry and the many marked differences found between cotton production in the Soviet Union and the United States. While the team recognizes that is is expected to look ahead at what may transpire over the next few years, its members approach this task with considerable trepidation.

Any effort to look ahead at what the future level of cotton production in the Soviet Union may be in several years involves a cumulative assessment of a number of separate factors. Indications are that the government will continue to give a high priority to cotton production and that this will be reflected in the continuation of policies:

(1) To extend irrigation into new areas capable of producing cotton and to give priority to cotton for the use of such land; (2) to improve water distribution and drainage systems, and to restore the productive capability of soils that have become saline; (3) to develop new and improved varieties of cotton and agronomic practices suited to the various ecological areas; (4) to provide machinery, fertilizer, insecticides, and herbicides on a priority basis for cotton production; (5) to encourage high production on state and collective farms by means of production targets, publicity with respect to goals, and recognition of superior accomplishment; and (6) to provide incentive prices.

If these policies are continued, the team believes that the technology of cotton production is sufficiently advanced and resources such as land, labor, machines, irrigation, and water in sufficient supply (or potential supply) as to justify the expectation that cotton production in the Soviet Union will experience a slight but steady upward trend over the next several years. However, the team does not visualize circumstances under which production will expand dramatically over such a period. Nor, as indicated above, does the team expect any lessening of the national commitment to cotton production which could be expected to lead to a declining trend in cotton output.

THE CHANGING PRODUCTION PICTURE

Cotton Producing Areas

For the past generation Uzbekistan has been by far the leading cotton producing Republic in the Soviet Union. In 1972 it accounted for 61 percent of the land area devoted to cotton and 65 percent of the total Soviet production. In 1940 this Republic accounted for 44 percent of the area and 63 percent of total production. In that earlier period and for some years thereafter, there was considerable cotton grown in the Soviet Union under rain-grown conditions. Virtually all of the rain-grown cotton, which accounted for almost one-fourth of the total area in cotton, was found in the Ukraine and RSFSR. Those Republics and Moldavia, where rain-grown cotton was grown in some years, and Armenia and Georgia, which raised irrigated cotton, have all drifted out of cotton production.

Irrigated cotton has been grown on a regular basis in Azerbaidzhan in the Transcaucasus and in Uzbekistan and the surrounding Republics of Turkmenistan, Tadzhikistan, Kazakhstan, and Kirgizia. These six Republics now account for all cotton production in the USSR, and as far as the Team could determine, all of it has been grown under irrigation starting with 1956.

One of the more outstanding characteristics of the Soviet cotton producing areas is their distance north of the Equator. The most southern cotton growing area in the Soviet Union is on about the same latitude as Fresno, Calif., and the northern boundaries of Arkansas and North Carolina. In fact, most of the Soviet crop is grown farther north than the cotton areas of most other cotton growing countries. This forces the USSR to place a great deal of emphasis on early maturing varieties that can yield well under prevailing environmental conditions.

Importance of Cotton

In the cotton producing Republics, cotton is but one of many lines of agricultural activity and yet it is the dominant agricultural product produced. Furthermore, in most, if not all, of these Republics cotton is the dominating factor in their entire economy. Clearly, it is government policy to give cotton top priority for resources whether land, water, labor, machinery, or fertilizer. Many other lines of

economic activity operate primarily to support the development and continued growth of the cotton producing industry. If irrigation water becomes scarce for an extended period, it is cotton that receives top priority; other crops must take the reduction.

Discussions with officials and agricultural leaders left no doubt that the USSR is committed to expanding cotton production. The 1971-75 National Plan calls for cotton area to reach 3 million hectares (7.4 million acres) by the end of the period, compared with 2.7 million hectares (6.8 million acres) in 1972. The 1975 goal for production is a crop of 7.2 million metric tons of seed cotton (11.1 million bales of lint), or only slightly below the 1972 level of 7.3 million metric tons (11.2 million bales). Cotton specialists visualize continually rising needs for greater cotton production as the population increases and per capita use of fiber continues to expand. Over the long run they talk of more reservoirs to better utilize available water resources, of improved canal systems to reduce water losses, and of the extension of irrigated cotton cultivation into certain arid or semiarid areas that hold a potential for cotton production if water is provided.

Offsetting part of this proposed expansion of cotton on new land will be some displacement of cotton by vegetable and fruit crops in established cultivated areas near population centers. Also, in certain areas where soil salinity or Verticillium wilt are serious problems, a reduction in cotton acreage may be brought about by crop rotation schemes or some of the various practices employed to correct salinity.

The importance of cotton in the economy of the Republics visited was manifested in the widespread use of the cotton boll as a major design in fabric, handcrafts, china, gates and gateposts, wall sections, fountains, and even as decorative lights around street lamp posts along principal avenues. These manifestations were especially noticeable in Tashkent, the capital of Uzbekistan, the largest cotton producing Republic in the USSR.

Psychology of Plan Fulfillment

One of the team's most vivid impressions during its travels in the cotton producing Republics of the USSR was the universal importance attached to the yearly production goal, or plan, for cotton. Overfulfillment of the plan is a badge of achievement that is the ambition of managers and administrators at all levels. Huge sign boards along the streets and by public buildings of capital cities, towns, and cotton-producing farms proclaim the planned production of the Republic, Oblast, Rayon, or farm, as the case might be. Charts, showing the performance in recent years of actual production in relation to the plan for cotton and other important crops, are much in evidence.

Farms normally allocate approximately one-fourth of their "expected earnings to labor" to bonuses designed to provide the maximum incentive to exceed, or at least to fulfill, the plan. During harvesttime, daily newspapers report the previous day's deliveries to the state procurement points and also season-to-date deliveries against the plan. One farm visited was obviously making a strong effort to see that each day's picking and delivery was larger than the previous day's. In many places, including museums and exhibit halls of economic achievement in the major cities, there were displayed large photographs of people honored for exceeding the plan or other outstanding performance at the work brigade, farm, or district levels. Obvious objectives are to develop a real sense of rivalry at each level of activity to stimulate an extra effort to exceed the plan or quota by the largest possible margin.

Acreage, Yield and Production

Cotton acreage, as reported officially by the USSR, has remained within the fairly narrow range of 2.1 million to 2.8 million hectares (5.1 million to 6.8 million acres) in 22 of the past 23 years. Over most of this period, acreage has shown a gradually rising trend. Production has trended upward at a steeper rate, and in 1970, 1971, and in 1972 it established new record highs. In the latter 2 years production was more than double the 1950 level. An effort is being made to push production still higher in 1973. Soviet officials expected that the 1972 crop, being harvested at the time of the team's visit, would equal or be slightly above the 1971 production of 7.1 million tons of seed cotton—the equivalent of 10.9 million bales. Production, in fact, totaled 7,296,000 tons—the equivalent of 11.2 million bales.

In recent years there has been a substantial upward trend in both yield per unit of land area and total production of cotton. In fact, in 3 of the past 6 years (1967, 1970, and 1971), Soviet cotton production has exceeded that of the United States and ranked first in the world.

There has been an inclination in certain quarters—including some individuals who have visited Soviet cotton areas as tourists in recent years—to question reported production levels. Even so, the team is inclined to accept the USSR reports of

deliveries of seed cotton, and of ginnings, at face value. The team had hoped to examine detailed data on production of both Upland and fine staple[2] cotton and to compare these with ginnings on an August 1 year basis, but such data had not been made available to the team by the time the report was otherwise completed.

It is recognized that the Soviet system of harvesting includes some very low-quality gleanings—which, if used at all in the textile industry, would go into only the lowest quality products. Some of this may also be used as padding in quilted-type garments or similar items.

Because of this harvesting characteristic in the USSR, approximately 3 to 5 percent of the total production might be discounted. Such an adjustment would put USSR estimated production on a comparable basis with that of most other cotton producing countries of the world. However, since some of this low grade cotton is known to enter international trade and appears in the consumption figures of countries where the cotton is used, it is believed better not to discount the production level.

[2]Egyptian-type varieties (*G. barbadense L.*) and the cotton produced from such varieties are normally referred to in the USSR as fine-staple. In this report the terms Egyptian-type; fine-staple; and extra-long staple (ELS); are used interchangeably even though some of the varieties and some of the production may have a staple length below 1⅛ inches.

Table 1.—Area devoted to cotton, by Republic, USSR, 1960-72[1]

Crop year	Uzbekistan	Tadzhikistan	Turkmenistan	Azerbaidzhan	Kazakhstan	Kirgizia	Other Republics	Total USSR
	1,000 hectares	*1,000 hectares*	*1,000 hectares*	*1,000 hectares*	*1,000 hectares*	*1,000 hectares*	*1,000 hectares*	*1,000 hectares*
1960	1,450	172	222	220	43	71	14	2,192
1961	1,510	201	249	240	43	76	13	2,332
1962	1,567	204	241	241	43	79	12	2,387
1963	1,628	217	257	245	44	79	10	2,480
1964	1,623	224	255	227	48	75	8	2,460
1965	1,617	228	257	215	46	73	6	2,442
1966	1,625	230	268	218	45	73	4	2,463
1967	1,603	233	275	210	46	73	2	2,442
1968	1,605	239	279	204	44	74		2,445
1969	1,669	242	312	198	45	74		2,540
1970	1,709	254	397	193	118	75		2,746
1971	1,707	261	401	206	118	77		2,770
1972	1,681	261	405	197	116	75		2,735
	1,000 acres	*1,000 acres*	*1,000 acres*	*1,000 acres*	*1,000 acres*	*1,000 acres*	*1,000 acres*	*1,000 acres*
1960	3,583	425	549	544	106	175	35	5,417
1961	3,731	497	615	593	106	188	32	5,762
1962	3,872	504	596	596	106	195	29	5,898
1963	4,023	536	635	605	109	195	25	6,128
1964	4,010	554	630	561	119	185	20	6,079
1965	3,996	563	635	531	114	180	15	6,034
1966	4,015	568	662	539	111	180	11	6,086
1967	3,961	576	679	519	114	180	5	6,034
1968	3,966	591	689	504	109	183		6,042
1969	4,124	598	771	489	111	183		6,276
1970	4,223	628	981	477	291	185		6,785
1971	4,218	645	991	509	292	190		6,845
1972	4,154	645	1,001	487	286	185		6,758

[1]*Sel'skoe Khozyaistvo* SSSR except for some instances in recent years where Russian official submissions to the International Cotton Advisory Committee were used. The only major difference was to lower Uzbekistan and raise Kazakhstan in 1970.

Table 2.–Production of cotton, by Republic, USSR, 1960-72

Crop year	Uzbekistan	Tadzhikistan	Turkmenistan	Azerbaidzhan	Kazakhstan	Kirgizia	Other Republics	Total USSR	
								Seed cotton	Lint cotton[1]
	1,000 metric tons unginned	*1,000 metric tons unginned*	*1,000 metric tons unginned*	*1,000 metric tons unginned*	*1,000 metric tons unginned*	*1,000 metric tons unginned*	*1,000 metric tons unginned*	*1,000 metric tons unginned*	*1,000 bales*
1960	2,949	399	363	366	49	126	37	4,289	6,800
1961	3,154	484	391	244	64	154	27	4,518	7,050
1962	3,006	435	378	277	55	125	28	4,304	6,700
1963	3,689	540	460	273	63	170	15	5,210	8,100
1964	3,671	546	463	340	81	168	16	5,285	8,200
1965	3,904	609	553	335	86	167	8	5,662	8,701
1966	4,083	631	656	336	88	184	3	5,981	9,192
1967	4,045	618	702	333	94	177	1	5,970	9,175
1968	4,011	642	712	333	70	177	(2)	5,945	9,136
1969	3,861	626	692	299	90	140		5,708	8,772
1970	4,495	727	869	336	276	187		6,890	10,588
1971	4,511	788	920	382	296	204		7,101	10,913
1972	4,710	743	931	431	292	189		7,296	11,212
1973[3]	4,750	750	930	430	265	190		7,315	

[1] Estimate of U.S. Department of Agriculture.
[2] Less than 500.
[3] Pledged production by cotton producing Republics.

Table 3.–Yield of cotton per unit of land area, by Republic, USSR, 1960-72

Crop year	Uzbekistan	Tadzhikistan	Turkmenistan	Azerbaidzhan	Kazakhstan	Kirgizia	Other Republics	Total USSR
	Centners per hectare	*Centners per hectare*	*Centners per hectare*	*Centners per hectare*	*Centners per hectare*	*Centners per hectare*	*Centners per hectare*	*Centners per hectare*
1960	20.3	23.2	16.3	16.6	11.5	17.7	26.9	19.6
1961	20.9	23.7	15.7	10.2	14.7	20.4	20.5	19.3
1962	19.2	21.3	15.7	11.5	12.8	15.8	23.1	18.0
1963	22.7	24.9	17.9	11.2	14.3	21.7	15.4	21.0
1964	22.6	24.4	18.1	15.0	17.0	22.4	17.6	21.5
1965	24.1	26.7	21.5	15.6	18.8	22.9	12.7	23.2
1966	25.1	27.4	24.5	15.4	19.6	25.3	9.6	24.3
1967	25.2	26.6	25.5	15.9	20.6	24.4	4.2	24.5
1968	25.0	26.9	25.4	16.4	15.9	24.0		24.3
1969	23.1	25.8	22.2	15.1	20.0	19.0		22.5
1970	26.3	28.6	21.9	17.4	23.5	25.0		25.1
1971	26.4	30.2	22.9	18.5	25.0	26.7		25.6
1972	28.0	28.5	23.0	21.9	25.2	25.1		26.7
	Pounds unginned cotton per acre	*Pounds unginned cotton per acre*	*Pounds unginned cotton per acre*	*Pounds unginned cotton per acre*	*Pounds unginned cotton per acre*	*Pounds unginned cotton per acre*	*Pounds unginned cotton per acre*	*Pounds unginned cotton per acre*
1960	1,811	2,070	1,454	1,481	1,026	1,579	2,400	1,749
1961	1,865	2,114	1,401	910	1,312	1,820	1,829	1,722
1962	1,713	1,900	1,401	1,026	1,142	1,410	2,061	1,606
1963	2,025	2,222	1,597	999	1,276	1,936	1,374	1,874
1964	2,016	2,177	1,615	1,338	1,517	1,999	1,570	1,918
1965	2,150	2,382	1,918	1,392	1,677	2,043	1,133	2,070
1966	2,239	2,445	2,186	1,374	1,749	2,257	856	2,168
1967	2,248	2,373	2,275	1,419	1,838	2,177	375	2,186
1968	2,230	2,400	2,266	1,463	1,419	2,141		2,168
1969	2,061	2,302	1,981	1,347	1,784	1,695		2,007
1970	2,346	2,552	1,954	1,552	2,097	2,230		2,239
1971	2,355	2,694	2,043	1,651	2,230	2,382		2,284
1972	2,498	2,543	2,052	1,954	2,248	2,239		2,382

Scale of Operation

Soviet cotton farms are large. There were 2,154 cotton growing farms in 1971 and the average cotton acreage per farm was 3,178 acres. Farms in Azerbaidzhan were substantially smaller than in the other Republics, averaging only 1,215 acres of cotton per farm, and in Kazakhstan substantially larger than average—5,214 acres per farm.

Both in terms of number of farms and total area in cotton, collective farms tend to dominate cotton production. The latest data available show that of the 2,137 farms then growing cotton, 1,883 were collectives and 254 were state farms. Although the collectives account for about three-fourths of the total area in cotton and of total cotton production they averaged only 2,651 acres of cotton per farm compared with an average of 6,992 acres of cotton on state farms.

Table 4.–Number and size of cotton growing farms, by Republic, 1971

Republic	Number of cotton farms	Area in cotton	Average area of cotton per farm
	Number	*1,000 acres*	*Acres*
Uzbekistan	1,151	4,218	3,665
Tadzhikistan	192	645	3,359
Turkmenistan	287	991	3,453
Azerbaidzhan	419	509	1,215
Kazakhstan	56	292	5,214
Kirgizia	49	190	3,878
Total USSR	2,154	6,845	3,178

Mechanization and Labor Utilization

For many years a high priority has been given in the USSR to the development of farm machines that can perform the various tasks associatied with cotton production. Currently, many such machines exist. Mechanization, therefore, has had a very real impact on cotton production and harvesting in the USSR. Machines are available for land preparation, planting, cultivating, spraying, and harvesting. Apparently all of these machines had been or were being used to some extent in all areas visited. It was noted that mechanical pickers are not used to pick cotton from which the seed is to be used as planting seed, nor are they used for early-picked extra-long staple cotton. (Mechanical cotton pickers are discussed in more detail in the section on harvesting.)

The team concluded that machine efficiency was rather low and, by U.S. standards, considerably out of balance with labor availability and use. Labor input was quite high as evidenced by the data in table 6 on direct labor inputs on collective and state farms and table 7, on direct labor inputs on selected highly efficient state farms. These data indicate that collective farms typically use somewhat more labor than state farms. Among collective farms, Azerbaidzhan has the highest labor input per

bale—over 300 hours in most recent years, but the average for all collective farms in the USSR has ranged from 233 to 264 hours per bale in the 5 years shown. On state farms the national average has ranged from 179 to 229 in the corresponding group of years. Data for four selected highly efficient state farms for six recent years show a range from as high as 148 to as low as 58 hours of labor per bale.

Even though a large amount of labor is still used in cotton production, many aspects of mechanization are considered by the Russians to be very worthwhile. For example, they point out that even the current level of machine picking shortens the picking season so that normally the crop is now out of the field before bad weather sets in. Thus, when moisture arrives in the form of fall rains, the crop is usually harvested and land preparation for the next crop can commence. Fall plowing has long been a recommended practice since cotton planted on fall-plowed land reportedly outyields cotton on spring-plowed land by a considerable margin.

Each practice—from stalk removal from the fields during the fall season through harvesting the crop the following year—seems to require relatively high hand-labor expenditures. Among these practices are: Stalk removal, thinning, weed hoeing, irrigation of unleveled fields, picking (in some areas), and gleaning of fields after machine harvesters have made two trips over the field. It was estimated that machine pickers leave at least 20 percent of the cotton in the field, on the stalks and on the ground. But, as far as the team could determine, such cotton is always carefully picked up, mostly by hand, and made a part of the total seed-cotton harvest.

A large portion of the crop is dried in drying yards before delivery to the procurement center or gin. The dumping, spreading, stirring, and reloading also require large amounts of hand labor.

Topping of cotton plants toward the end of the fruiting period is a customary and widespread practice. The Upland plants are topped to a height of about 1 meter (39 inches) and ELS plants are topped to about 110 centimeters (43 inches). Reasons given for topping are to open up the plant, to hasten boll maturation, and to increase picking efficiency. Topping by machine is practiced, but most topping that the team saw appeared to have been done by hand. Most of the cotton is defoliated with chlorate defoliants before harvesting. Some phosphates are also being used for defoliation.

Considerable hand labor is used for weed control in spite of the fact that herbicides were reported to have been used rather widely and tractor cultivation equipment is abundant.

Fertilizers and Weed Control

The USSR gives cotton a high priority on fertilizer availability. Throughout the areas visited, fertilizer practices were similar. Soil tests reportedly were used extensively for determining fertilizer needs. Fertilizer was generally reported to be applied at the rate of 150 to 250 kilograms per hectare (134 to 223 pounds per acre) for both nitrogen and phosphorous and from 0 to 70 kilograms per hectare (0 to 62 pounds per acre) for potassium. No micronutrients were being used since tests were reported to indicate that there are no deficiencies. Some farms that are following a rotation pattern of 7 years of cotton followed by 3 years of alfalfa reported applying about 40 metric tons of animal manure per hectare (about 18 short tons per acre) between the third and fourth year the land was in cotton.

Fluometuron, known under the trademark Cotoran®, is reported to be the only herbicide applied for control of annual weeds. Farm officials reported that it can control up to 90 percent of their annual weeds which include pigweed, purslane, morning glory, and annual grasses. Some dalapon, known under the trademark Dalapon®, is being used on perennial weeds such as johnsongrass and bermudagrass. Nutsedge is a problem but is handled by cultivation, rotation, and hand hoeing. One practice being followed to control perennials is that of deep plowing and harrowing rhizomes.

With few exceptions, cotton fields were found to be clean on all farms visited. Those seen from the roads may have had more weeds than the fields visited but for the most part, they would be classed as generally clean.

Some agricultural chemicals appeared to be in much more abundant supply than others. The team was frequently told that commercial use was low to nil in the case of some insecticides and herbicides for which favorable test results were reported by experiment stations. In most cases, the key factor appeared to be whether the material was produced in the Soviet Union or was imported. If produced domestically, they could expect to obtain desired quantities, but as long as it remained an imported item, the availability might be insufficient for widespread use unless it were granted priority status for foreign exchange as appears to be the case with fluometuron, which is imported from Switzerland.

Table 6.–Direct labor input on collective and state farms in producing and harvesting cotton, 1962 and 1967-70

Item	Uzbekistan	Tadzhikistan	Turkmenistan	Azerbaidzhan	Kazakhstan	Kirgizia	Total USSR
	Days per centner/of unginned cotton	*Days per centner/of unginned cotton*	*Days per centner/of unginned cotton*	*Days per centner/of unginned cotton*	*Days per centner/of unginned cotton*	*Days per centner/of unginned cotton*	*Days per centner/of unginned cotton*
1962:							
Collective farms ...	5.2	5.7	5.0	6.5	4.8	4.3	5.3
State farms	3.9	4.2	5.3	4.6	5.2	4.7	4.0
1967:							
Collective farms ...	5.2	5.8	4.7	6.8	4.7	4.3	5.3
State farms	3.9	4.4	5.1	5.0	4.4	5.6	4.1
1968:							
Collective farms ...	5.2	5.6	4.7	6.6	5.7	4.0	5.3
State farms	4.2	4.8	4.9	4.8	4.9	5.4	4.3
1969:							
Collective farms ...	6.0	6.0	5.1	7.0	5.2	5.9	5.9
State farms	5.1	4.0	5.9	6.3	4.4	7.7	5.1
1970:							
Collective farms ...	5.3	5.3	4.4	6.8	4.5	4.9	5.2
State farms	4.3	4.0	4.3	4.3	4.7	6.2	4.4
	Hours per bale	*Hours per bale*	*Hours per bale*	*Hours per bale*	*Hours per bale*	*Hours per bale*	*Hours per bale*
1962:							
Collective farms ...	233	256	224	291	215	193	238
State farm	175	188	238	206	233	211	179
1967:							
Collective farms ...	233	260	211	305	211	193	238
State farms	175	197	229	224	197	251	184
1968:							
Collective farms ...	233	251	211	296	256	179	238
State farms	188	215	220	215	220	242	193
1969:							
Collective farms ...	269	269	229	314	233	264	264
State farms	229	179	264	282	197	345	229
1970:							
Collective farms ...	238	238	197	305	202	220	233
State farms	193	179	193	193	211	278	197

Table 7.--Direct labor input in producing and harvesting cotton on selected highly efficient state farms, 1966-71

State farm and item	1966	1967	1968	1969	1970	1971
Maler Farm (Uzbekistan):						
Man-days of labor per centner of unginned cotton	2.16	1.30	2.00	2.10	1.77	1.29
Hours per bale	97	58	90	94	79	58
Percent of crop machine-picked	95.0	99.5	86.8	90.8	95.6	97.2
Pyatiletiya Farm (Uzbekistan):						
Man-days of labor per centner of unginned cotton	2.00	2.00	2.50	2.50	1.81	1.70
Hours per bale	90	90	112	112	81	76
Percent of crop machine-picked	81.5	84.3	82.0	80.0	79.1	81.7
Savaj Farm (Uzbekistan):						
Man-days of labor per centner of unginned cotton	1.80	2.20	2.30	3.30	2.63	2.40
Hours per bale	81	99	103	148	118	108
Percent of crop machine-picked	80.4	74.2	76.6	62.9	73.4	70.4
Pakhtaaral Farm (Kazakhstan):						
Man-days of labor per centner of unginned cotton	2.20	1.51	2.57	3.17	2.00	1.63
Hours per bale	99	68	115	142	90	73
Percent of crop machine-picked	69.3	86.7	70.5	55.1	66.9	73.8

Diseases and Insects

Although the team believes that the strong government policy, for expanded cotton production, and its manifestation in a number of programs to encourage the achievement of this objective, will result in gradual expansion of cotton production, it is nonetheless aware of the presence of important negative factors. Among these are the problems with Verticillium wilt, clearly the most serious disease problem faced by cotton in the Soviet Union. Efforts to deal with it include breeding, land selection, crop rotation, and stalk removal from fields. The first of these is discussed in the section dealing with breeding and genetics, and stalk removal is mentioned briefly in the section on mechanization and labor utilization.

The farm operator can exert some influence on the wilt problem by deciding which fields should be placed in cotton and which should be in other uses. In areas of widespread and intense infestation, and especially in the typical situation where cotton occupies a high percentage of the total irrigated cropland on the farm, the manager may have little non-infested irrigated land available and thereby be forced to decide whether to plant cotton on heavily infested land and suffer a loss of yield or to reduce his cotton acreage.

The most frequently mentioned and highest regarded rotation is cotton-alfalfa. It involves something of the same type of impasse. A farmer bothered by wilt may want to place some of his most severely infested cotton land into alfalfa. However, he may find that to do so will jeopardize the farm's meeting its goal for cotton production and thus reduce its income. Therefore, the fullest control of Verticillium wilt through either land selection or crop rotation is difficult, or maybe impossible when such a high percentage of irrigated cropland is devoted to cotton. In some parts of Uzbekistan the ratio of alfalfa to cotton area on cotton farms is several times greater than in other areas and in none of the oblasts does the 1969 data indicate more than 10.4 acres of alfalfa per 100 acres of cotton.

Total alfalfa acreage has been increasing in the four leading cotton Republics for which data are available. However, this information presumably relates to the total alfalfa grown on all types of farms and data are not at hand to indicate whether the alfalfa acreage on cotton farms has followed the same trend as total alfalfa acreage.

In order to see whether any current trend in damage from Verticillium wilt could be detected through time, the team asked for and was provided with cotton acreage, production, and yield data by Oblasts for Uzbekistan for the years 1966-71. The data are not conclusive from a cause and effect standpoint, but they do suggest that the main gains in

cotton acreage over this 6-year period were in the areas where the ratio of alfalfa to cotton was lowest. However, cotton acreage was generally maintained in the areas with the highest ratios of alfalfa to cotton.

The team felt that rotations are accorded a higher potential for effective control of wilt in the USSR than in the United States, but that, in practice, the U.S. farmer's performance with respect to rotation may be better largely because the U.S. farmer usually places a lower percentage of his potential cotton land in that crop in any given year.

Generally, farmers and professional people in the field seemed to think that they had experienced greater success with wilt control through plant resistance and crop rotation than is the case in the United States. However, toward the end of the study when these practices were discussed with scientists at the Institutes of Plant Protection and Plant Breeding in Leningrad, the team concluded from the information made available that success in the USSR with wilt control through variety resistance and rotations was about on the same level as in the United States.

Other diseases were mentioned and dismissed as being of little significance in cotton production operations. Some scientists reported that seedling diseases, perhaps rhizoctonia, occasionally caused a minor problem. The team was told that cotton planting seed is treated with a copper fungicide for control of seedling diseases.

The cotton insect problems throughout the USSR are minor compared with those in the United States. Spider mites and the cotton moth were the pests generally mentioned as requiring control measures. Dameton, known under the trademark Systox® is the insecticide generally used for spider mites. Newer experimental materials such as Folozan (France) and Mjlbex (Japan) give control of mites which have become resistant to older chemicals in some areas. These materials apparently are in the same chemical family as dicifol, known under the trademark as Kelthane®. During the team's tour, no evidence of spider mite damage was observed.

The cotton moth is the major cotton insect. It lays eggs on cotton foliage and the larva feeds on squares and bolls much like our bollworm (*Heliothis*). In most countries, this insect is recongnized as belonging to the *Heliothis Armigera* (Complex) but in the USSR it is considered to be in the genus *Chlorida*. About three generations develop each year, and when present in damaging numbers, control of these pests may require up to four applications per year of carbaryl, known under the trademark Sevin®.

Table 8.–Ratio of cotton to alfalfa acreage on cotton farms in Uzbekistan, by oblast, 1969

Area	Acreage in cotton	Acreage in alfalfa[1]	Acres of alfalfa per 100 acres of cotton
	1,000 acres	*1,000 acres*	*Acres*
Tashkent	352	33	9.4
Syr Darya	632	66	10.4
Fergana	470	20	4.3
Namangan	326	8	2.4
Andizhan	456	19	4.2
Samarkand	428	9	2.2
Bukhara	394	39	9.9
Kashkadar	234	6	2.5
Surkhandar	287	17	5.8
Khorezm	256	7	2.5
Karakalpak ASSR	287	7	2.4
Total Uzbekistan	[2]4,124	231	5.6

[1]Oblast data adjusted proportionately to conform to Republic total.
[2]Oblast data do not necessarily add to Republic total.

Table 9.—Area of alfalfa, actual and as a percentage of area in cotton in selected cotton growing Republics of the Soviet Union, 1965-72[1]

Item	Uzbekistan	Tadzhikistan	Turkmenistan	Azerbaidzhan	Total four Republics
Area in alfalfa:	*1,000 hectares*	*1,000 hectares*	*1,000 hectares*	*1,000 hectares*	*1,000 hectares*
1965	205.9	34.6	46.5	62.9	349.9
1966	234.3	41.1	49.7	76.4	401.5
1967	259.4	45.7	61.1	96.1	462.3
1968	273.6	48.6	68.0	115.1	505.3
1969	271.5	52.9	67.2	130.6	522.2
1970	294.4	56.6	68.8	136.0	555.8
1971	340.7	72.1	83.0	148.1	643.9
1972[2]	356.1	80.2	100.1	155.2	691.6
	1,000 acres	*1,000 acres*	*1,000 acres*	*1,000 acres*	*1,000 acres*
1965	509	85	115	155	864
1966	579	102	123	189	993
1967	641	113	151	237	1,142
1968	676	120	168	284	1,248
1969	671	131	166	323	1,291
1970	272	140	170	336	1,373
1971	842	178	205	366	1,591
1972[2]	880	198	247	383	1,708
Alfalfa as a percentage of cotton area:	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
1965	13	15	18	29	15
1966	14	18	19	35	17
1967	16	20	22	46	20
1968	17	21	24	56	22
1969	16	22	21	66	22
1970	17	22	17	70	22
1971	20	28	21	72	25
1972[2]	21	31	25	79	27

[1] Data relate to total alfalfa acreage which is considerably more than the acreage of alfalfa on cotton farms.
[2] Preliminary.

Table 10.—Planted acreage of cotton in Uzbekistan, by oblast, 1966-71

Year	Tashkent	Syr Darya	Fergana[1]	Namangan[1]	Andizhan[1]	Samarkand	Bukhara	Kashkadar	Surkhandar	Khorezm	Karakalpak ASSR	Total Uzbekistan[2]
	1,000 hectares	*1,000 hectares*	*1,000 hectares*	*1,000 hectares*	*1,000 hectares*	*1,000 hectares*	*1,000 hectares*	*1,000 hectares*	*1,000 hectares*	*1,000 hectares*	*1,000 hectares*	*1,000 hectares*
1966	142.6	223.1	201.6		296.5	166.3	161.6	92.6	112.1	100.3	128.8	1,625
1967	137.4	229.5	187.9	129.4	179.3	162.7	155.8	91.0	110.6	100.3	119.5	1,603
1968	137.1	231.0	188.7	129.9	179.3	162.7	153.0	91.7	111.5	101.7	118.5	1,605
1969	142.4	255.6	190.2	132.1	184.7	173.2	159.6	94.6	116.3	103.7	116.2	1,669
1970	145.3	277.6	209.0	148.2	192.9	185.9	165.9	114.1	119.3	104.5	120.0	1,709
1971	143.3	226.5	192.4	135.7	185.0	178.3	163.5	110.0	133.7	108.0	131.0	1,707
	1,000 acres	*1,000 acres*	*1,000 acres*	*1,000 acres*	*1,000 acres*	*1,000 acres*	*1,000 acres*	*1,000 acres*	*1,000 acres*	*1,000 acres*	*1,000 acres*	*1,000 acres*
1966	352.4	551.3	498.2		732.7	410.9	399.3	228.8	277.0	247.8	318.3	4,015
1967	339.5	567.1	464.3	319.7	443.1	402.0	385.0	224.9	273.3	247.8	295.3	3,961
1968	338.8	570.8	466.3	321.0	443.1	402.0	378.1	226.6	275.5	251.3	292.8	3,966
1969	351.9	631.6	470.0	326.4	456.4	428.0	394.4	233.8	287.4	256.2	287.1	4,124
1970	359.0	685.9	516.4	366.2	476.7	459.4	410.0	282.0	294.8	258.2	296.5	4,223
1971	354.1	559.7	475.4	335.3	375.1	440.6	404.0	271.8	330.4	266.9	323.7	4,218

[1] Namangan Oblast, formed in 1967, consists of what was formerly six rayons in Andizhan Oblast and one rayon in Fergana Oblast. Data for 1966 included in Andizhan and Fergana.
[2] Oblast data do not necessarily add to Republic total.

Table 11.–Production of unginned cotton in Uzbekistan, by oblast, 1966-72

Year	Tashkent	Syr Darya	Fergana[1]	Namangan[1]	Andizhan[1]	Samarkand	Bukhara	Kashkadar	Surkhandar	Khorezm	Karakalpak	Total Uzbekistan[2]
	1,000 metric tons	*1,000 metric tons*	*1,000 metric tons*	*1,000 metric tons*	*1,000 metric tons*	*1,000 metric tons*	*1,000 metric tons*	*1,000 metric tons*	*1,000 metric tons*	*1,000 metric tons*	*1,000 metric tons*	*1,000 metric tons*
1966	349.6	457.4	516.4		830.9	408.2	344.9	217.6	316.6	351.5	288.8	4,083
1967	362.8	484.6	475.3	367.0	458.5	367.8	367.5	208.1	332.3	354.7	257.0	4,045
1968	315.8	372.0	473.1	350.0	481.2	371.1	370.4	252.2	346.3	376.7	300.6	4,011
1969	317.2	460.1	453.1	304.4	391.9	365.1	401.9	271.5	343.5	330.4	222.6	3,861
1970	380.0	575.6	494.8	374.4	501.4	443.4	469.0	301.8	385.5	407.2	334.6	4,495
1971	388.7	473.9	504.0	392.7	527.5	453.4	418.0	252.5	363.0	415.4	321.5	4,511
1972[3]	402.0	515.0	556.0	421.0	584.0	438.0	440.0	343.0	392.0	345.0	266.0	4,710

[1] Namangan Oblast, formed in 1967, consists of what was formerly six rayons in Andizhan Oblast and one rayon in Fergana Oblast. Data for 1966 included in Andizhan and Fergana.
[2] Oblast data do not necessarily add to Republic total.
[3] Preliminary.

Table 12.–Yield of cotton in Uzbekistan, by oblast, 1966-71

Year	Tashkent	Syr Darya	Fergana[1]	Namangan[1]	Andizhan[1]	Samarkand	Bukhara	Kashkadar	Surkhandar	Khorezm	Karakalpak	Total Uzbekistan
	Centners unginned cotton/ per hectare	*Centners unginned cotton/ per hectare*	*Centners unginned cotton/ per hectare*	*Centners unginned cotton/ per hectare*	*Centners unginned cotton/ per hectare*	*Centners ungined cotton/ per hectare*	*Centners unginned cotton/ per hectare*	*Centners unginned cotton/ per hectare*	*Centners unginned cotton/ per hectare*	*Centners unginned cotton/ per hectare*	*Centners unginned cotton/ per hectare*	*Centners unginned cotton/ per hectare*
1966	24.5	20.5	25.6		28.0	24.5	21.3	23.5	28.2	35.0	22.4	25.1
1967	26.4	21.1	25.3	28.4	25.6	23.2	23.6	22.8	20.1	35.4	21.5	25.2
1968	23.0	16.1	25.1	26.9	26.8	22.8	24.2	27.5	31.1	37.0	25.4	25.0
1969	22.3	18.0	23.8	23.0	21.2	21.1	25.2	28.7	29.5	31.9	19.1	23.1
1970	26.2	20.7	23.7	25.3	26.0	23.8	28.3	26.5	32.3	39.0	27.9	26.3
1971	27.1	20.9	26.2	28.9	28.5	25.4	25.6	23.0	27.1	38.5	24.5	26.4
	Pounds lint/per acre[2]	*Pounds lint/per acre[2]*	*Pounds lint/per acre[2]*	*Pounds lint/per acre[2]*	*Pounds lint/per acre[2]*	*Pounds lint/per acre[2]*	*Pounds lint/per acre[2]*	*Pounds lint/per acre[2]*	*Pounds lint/per acre[2]*	*Pounds lint/per acre[2]*	*Pounds lint/per acre[2]*	*Pounds lint/per acre[2]*
1966	743	622	777		849	743	646	713	855	1,062	679	737
1967	801	640	754	862	777	704	716	692	913	1,074	652	743
1968	698	488	761	816	813	792	734	834	843	1,122	770	737
1969	676	546	722	698	643	640	764	871	895	968	579	683
1970	795	628	719	767	789	722	858	804	980	1,183	846	761
1971	822	634	795	877	865	770	777	698	822	1,168	743	777

[1] Namagan Oblast formed in 1967, consists of what was formerly six rayons in Andizhan Oblast and one rayon in Fergana Oblast. Data for 1966 included in Andizhan and Fergana.
[2] Assuming lint outturn of 34 percent.

Irrigation and Water Management

The team was informed by Republic and local officials in the cotton prodcution areas that 100 percent of the cotton crop was under irrigation and no charge is made to the farm or to the production operation for the water used. They pointed out that ample water was available for irrigation of their current acreage, but they mentioned that in parts of Uzbekistan, water shortages sometimes occurred between mid-July and mid-August. However, as noted in the section on Importance of Cotton, whenever water becomes relatively scarce, it is normal to give cotton top priority and force the bulk of any reduction of water to fall entirely or at least mainly against other crops.

Approximate irrigation water requirements ranged from 20 inches in areas of higher rainfall to 48 inches in areas of lower rainfall. The cotton area was practically all preirrigated—in the winter on heavy textured soils and in the spring on lighter soils. Four

to five crop irrigations were ususl. Officials estimated that 99 percent of the irrigated cotton received water from irrigation projects and delivery canals, while only 1 percent was derived from deep-well pumps. No deep-well pumps were seen.

The team traveled through one or two projects in which arid (desert) lands were being developed for irrigation by land leveling to an engineered grade with heavy mechanical earth-moving machines. However, as far as could be determined, a large percentage of fields or land areas now producing cotton had received little or no large-scale land leveling or grading. As is to be expected under such conditions, there was considerable variation in the length of the water run. A small percentage of the land was naturally smooth and level enough to allow rather long runs. But in most fields the slope of the land was such that short to very short runs had to be used in order to achieve anything approaching uniformity in water distribution. Water was usually delivered to the high point of a cotton field in an open ditch, but occasionally this is done by means of open concrete flumes. From the delivery point on the supply canals, the water was distributed to the field in small open ditches and run down each furrow by gravity. Typically, the average length of run was short. No pipelines, siphon pipes, gated pipe, or sprinklers were observed in use. The only light-weight irrigation pipe observed was designed to be coupled together with a gasket and four bolts. This pipe was stored on an experiment station.

Cotton is irrigated later in the season than is customary in the United States. The team observed fields being irrigated as late as October 6, when one-third to a half of the crop was still in the green-boll stage. Many other fields were wet as a result of recent irrigation when visited at the end of September and the first part of October. In some fields, irrigation water had been applied after the first picking. Officials stated that the practice of late irrigation is old and well established, and it was reported that it increased the yield and also improved the quality of both the lint and seed. However, there appeared to be some uncertainty on the part of some Soviet cotton specialists whether late irrigations increased or decreased yields on wilt infested areas.

Of all of the cotton production practices that the team saw in the USSR, the practice of late-season irrigation was one of the most strikingly different from those in the United States. In the United States, irrigation at such a relatively late stage of crop maturity would be counter productive for a number of reasons:

(1) Reductions in yield and fiber quality would be expected as a result of (a) reduced maturity rates caused by suboptimal, but above freezing, temperatures or (b) by a precipitous cut-off of growth and damage to immature fibers in green (unopened) bolls as a result of a killing frost or (c) or both.

(2) Excessive vegetative growth would impede harvesting operations and cause a lowering of lint grades.

(3) Costs of insect control would be increased and opportunity for successful over-wintering of diapausing insects would be greater.

Concerning irrigation productivity, one farm official reported that one man could irrigate about 2 hectares (5 acres) of cotton. After observing the irrigation methods utilized in many areas, one of the most impressive points of difference with US practice was the high labor requirement to water the cotton.

Harvesting

In harvesting, as well as in other aspects of cotton production, the USSR attaches great importance to the development and use of machines that will perform jobs previously done by hand. According to data made available to the team there were nearly 42,000 mechanical cotton pickers on farms in the Soviet Union in the fall of 1972. Of these, nearly 15,000 were the comparatively new four-row model. Machines picked 38.1 percent of the total crop in 1971. On state farms the percentage was 55.5 percent and on the more numerous collective farms it was 32.7 percent.

By Republics, greatest reliance was placed on machine picking in Kazakhstan and Kirgizia, where 58.1 and 51.8 percent respectively was machine picked. In contrast, only 18.9 percent was machine picked in Azerbaidzhan, which was the only Republic to machine pick less cotton than called for by the official plan. Tadzhikistan machine picked 21.9 percent of its crop and Uzbekistan 40.7 percent. In all Republics, the percentage was higher on state farms than on collective farms.

Although the bulk of the Soviet cotton crop is still picked by hand, the share picked mechanically is increasing. For example, the 38.1 percent picked by machine in 1971 compares with 6.6 percent a decade earlier. The various people interviewed expect the proportion of the crop that will be picked mechanically to continue to increase. The team saw both two- and four-row pickers in use in fields of Upland cotton. Extra-long staple cotton is still picked by hand—at least the first two pickings—but

efforts are being made to design machines that will handle extra-long staple cotton satisfactorily.

The Soviet picker is a spindle machine but its design is quite different from the typical U.S. picker. The Soviet picker compresses the plant considerably more than the U.S. machine. This is made necessary by the use of verticle barbed spindles that pass along the sides of the greatly constricted plant as it slides through the very narrow picker head. The narrowness of the passage appeared to cause considerable damage to the plant during the first picking if there was still a heavy crop of unopened bolls.

Both two-row and newer four-row pickers are commonly used on 60-cm. (24 inch) row. Only two-row pickers are used on 90-cm. (36 inch) rows but the team was told that a four-row picker for 90-cm. rows is being developed. The current trend appeared to be for increased use to be made of the wider rows.

The team feels that picking efficiency was low compared with U.S. experience. In one instance where open cotton represented between one-half and three-quarters of a bale per acre, the picking efficiency was very low and a large part of the open cotton was being left on the plant or knocked to the ground. However, in general, the picking efficiency averaged higher than in this particular instance. The team was told that following the second picking, it was customary to remove late or unharvested bolls with a stripper and to glean the fields by hand or machine for cotton that was otherwise missed.

Table 13.–Number of cotton picking machines by Republic and kind - Oct. 1, 1972

Republic	Four-row machines	Other machines	Total
	Thousands	*Thousands*	*Thousands*
Uzbekistan	8.8	19.5	28.3
Tadzhikistan	.9	2.0	2.9
Turkmenistan	2.8	1.5	4.3
Azerbaidzhan	1.4	.8	2.2
Kazakhstan	.3	2.4	2.7
Kirgizia	.5	1.0	1.5
Total USSR	14.7	27.2	41.9

Cotton is hauled from the field to the drying yard and then to the procurement centers in "universal trailers" that hold about two bales and are equipped with hydraulic dumping mechanisms working off the tractor that pulls them. Since the trailer boxes are rather small in relation to the basket on the picker, the process of dumping the picker basket is slow and labor-consuming, since a considerable amount of cotton spills over the sides of the trailer and must be picked up by hand and returned to the trailer. Furthermore, because of the relatively small trailer box, cotton must be tramped after the first picker-basket load is deposited to make room for loading additional amounts.

All cotton is sold by the farms unginned. Under the Soviet system, there are four grades of unginned cotton, based on fiber quality, moisture, and trash content. In Central Asia, No. 1 grade seed cotton must not exceed 8 percent moisture, No. 2 grade 10 percent, No. 3 grade 11 percent, and No. 4 grade 13 percent. The corresponding values for cotton in the Transcaucasus are 1 percentage point higher.

Table 14.–Quantity of cotton picked by machine, by Republic, 1960-71

Year	Uzbekistan	Tadzhikistan	Turkmenistan	Azerbaidzhan	Kazakhstan	Kirgizia	Armenia	Total USSR
	1,000 metric tons unginned cotton	*1,000 metric tons unginned cotton*	*1,000 metric tons unginned cotton*	*1,000 metric tons unginned cotton*	*1,000 metric tons unginned cotton*	*1,000 metric tons unginned cotton*	*1,000 metric tons unginned cotton*	*1,000 metric tons unginned cotton*
1960	501	2	12	15	8	13	(1)	551
1961	233	11	18	5	12	12	(1)	291
1962	310	14	30	11	2	16	(1)	383
1963	578	20	35	17	4	30	(1)	684
1964	816	79	87	18	19	50	(1)	1,069
1965	910	88	110	21	18	60		1,207
1966	1,329	126	176	31	23	70		1,755
1967	1,563	116	195	33	32	76		2,015
1968	1,625	145	229	65	27	85		2,176
1969	1,140	132	224	54	41	41		1,632
		152	297	44	43	75		2,177
		173	329	72	172	106		2,709

Table 15.—Proportion of cotton on collective farms, state farms, and all farms picked by machine, by Republic, 1961-71

Item	Uzbekistan	Tadzhikistan	Turkmenistan	Azerbaidzhan	Kazakhstan	Kirgizia	Armenia	Total USSR
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
1961:								
Collective ...	6.0	2.1	4.3	1.4	6.3	6.8	1.0	5.0
State	15.8	3.5	8.0	10.2	39.9	14.0	—	15.5
All	7.7	2.2	4.5	2.2	19.0	7.9	1.0	6.6
1962:								
Collective ...	9.2	3.2	7.0	3.3	—	13.2	.1	7.8
State	17.6	2.1	23.5	9.6	8.7	12.4	2.0	16.2
All	10.7	3.2	8.0	3.9	3.8	13.1	.2	9.1
1963:								
Collective ...	11.9	3.2	6.7	5.6	4.1	14.5	.1	9.9
State	28.5	.6	25.7	11.1	8.4	40.0	—	26.5
All	15.7	3.7	7.7	6.1	6.8	17.7	.1	13.1
1964:								
Collective ...	18.1	13.6	16.9	4.9	3.9	29.5	.3	16.7
State	36.2	22.5	44.0	10.0	34.6	31.2	—	34.7
All	22.2	14.4	18.8	5.3	23.0	29.8	.3	20.3
1965:								
Collective ...	18.8	13.7	18.3	5.5	4.0	34.1	—	18.8
State	38.8	21.1	40.7	13.4	30.1	43.6	—	36.4
All	23.3	14.5	19.8	6.3	21.1	35.6	—	21.3
1966:								
Collective ...	27.9	20.9	25.4	8.0	6.4	35.7	—	25.5
State	47.6	14.2	46.6	23.7	37.8	47.9	—	44.3
All	32.5	20.0	26.8	9.3	26.2	37.8	—	29.3
1967:								
Collective ...	33.3	18.7	25.8	9.2	16.3	41.0	—	29.1
State	55.7	18.7	51.9	16.2	45.0	50.8	—	52.1
All	38.6	18.8	27.9	9.8	34.2	42.7	—	33.7
1968:								
Collective ...	35.4	21.9	30.3	19.1	23.5	47.6	—	32.4
State	56.6	27.9	55.2	22.4	47.8	51.2	—	53.6
All	40.5	22.6	32.2	19.4	38.0	48.3	—	36.6
1969:								
Collective ...	25.7	20.3	31.5	18.4	29.4	27.5	—	25.3
State	40.0	25.7	42.0	15.8	55.7	36.5	—	39.4
All	29.5	21.1	32.3	18.2	45.9	29.2	—	28.6
1970:								
Collective ...	27.0	19.4	32.2	12.8	33.7	40.4	—	26.5
State	51.1	29.6	58.8	15.6	45.3	37.4	—	48.8
All	33.5	21.0	34.2	13.1	40.4	39.8	—	31.6
1971:								
Collective ...	34.6	20.3	35.8	18.5	50.5	50.4	—	32.7
State	57.7	30.0	59.0	25.0	61.3	57.1	—	55.5
All	40.7	21.9	37.9	18.9	58.1	51.8	—	38.1

Table 16.–Percentage of plan fulfillment for cotton picked by machine[1], 1961-71

Year	Uzbekistan	Tadzhikistan	Turkmenistan	Azerbaidzhan	Kazakhstan	Kirgizia	Total USSR
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
1961	38.8	18.0	—	10.8	---	—	—
1962	—	17.2	—	20.1	---	—	—
1963	92.3	22.8	47.1	21.0	35.8	100.3	75.2
1964	108.8	87.4	102.0	22.7	97.0	111.0	100.0
1965	91.0	88.2	109.6	47.4	78.7	108.2	91.3
1966	115.5	120.0	140.9	52.0	89.0	106.9	114.6
1967	115.7	105.0	130.3	54.3	141.0	90.3	113.4
1968	104.8	120.3	131.0	92.4	89.3	106.5	107.4
1969	67.0	101.7	111.0	68.1	131.1	51.1	73.6
1970	87.0	108.8	129.3	48.6	121.7	92.2	91.6
1971	108.8	110.0	129.1	80.1	122.9	117.8	110.7

[1] Percentage that quantity of cotton picked by machine is of Plan level of cotton to be picked by machine.

Table 17.–Quantity of cotton machine harvested, by type of picker and by Republic, 1966-71

Year	Uzbekistan	Tadzhikistan	Turkmenistan	Azerbaidzhan	Kazakhstan	Kirgizia	Total USSR
	1,000 metric tons/of unginned cotton	*1,000 metric tons/of unginned cotton*	*1,000 metric tons/of unginned cotton*	*1,000 metric tons/of unginned cotton*	*1,000 metric tons/of unginned cotton*	*1,000 metric tons/of unginned cotton*	*1,000 metric tons/of unginned cotton*
Total machine-picked:							
1966	1,329.0	126.4	176.2	31.2	23.1	69.5	1,755.4
1967	1,563.0	115.8	195.4	32.7	32.3	75.8	2,015.0
1968	1,624.6	144.9	229.3	64.7	26.8	85.3	2,175.6
1969	1,139.6	132.2	223.7	54.5	41.4	40.9	1,632.3
1970	1,566.0	152.4	297.4	43.8	42.6	74.6	2,176.8
1971	1,837.0	172.8	348.6	72.2	172.1	106.0	2,708.7
Total picked with spindle machines:							
1966	1,082.0	88.2	109.1	30.5	19.0	56.5	1,385.3
1967	1,291.8	81.0	135.5	32.7	27.9	63.3	1,632.2
1968	1,379.4	102.4	156.6	64.7	21.2	73.2	1,797.5
1969	947.6	90.1	152.7	54.5	27.9	35.9	1,308.7
1970	1,402.0	118.8	245.7	43.1	37.3	68.8	1,915.7
1971	1,781.9	147.8	280.5	72.2	163.3	99.9	2,545.6
Total picked with strippers and gleaners:							
1966	247.0	38.2	67.1	.7	4.1	13.0	370.1
1967	271.2	34.8	59.9	---	4.4	12.5	382.8
1968	245.2	42.5	72.7	---	5.6	12.1	378.1
1969	192.0	42.1	71.0	---	13.5	5.0	323.6
1970	164.0	33.6	51.7	.7	5.3	5.8	261.1
1971	55.1	25.0	68.1	---	8.8	6.1	163.1

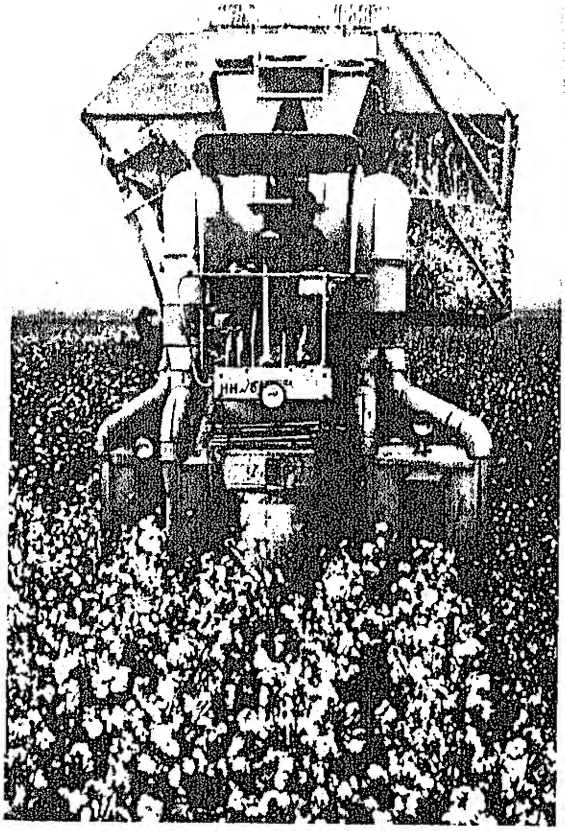
COST OF PRODUCTION

As one might well imagine, it is difficult, if not impossible, to make meaningful cost-of-production comparisons between a socialist and a capitalist country. Concepts of cost are entirely different. For instance, in the USSR no charge is made for either land or water. Even so, the team sought information on cost of production and was supplied the information summarized in the accompanying table. About the only firm conclusions the team is willing to draw from these data are that costs, even by Soviet standards, have risen in recent years, and are higher in Turkmenistan and Azerbaidzhan than elsewhere in the Soviet cotton areas.

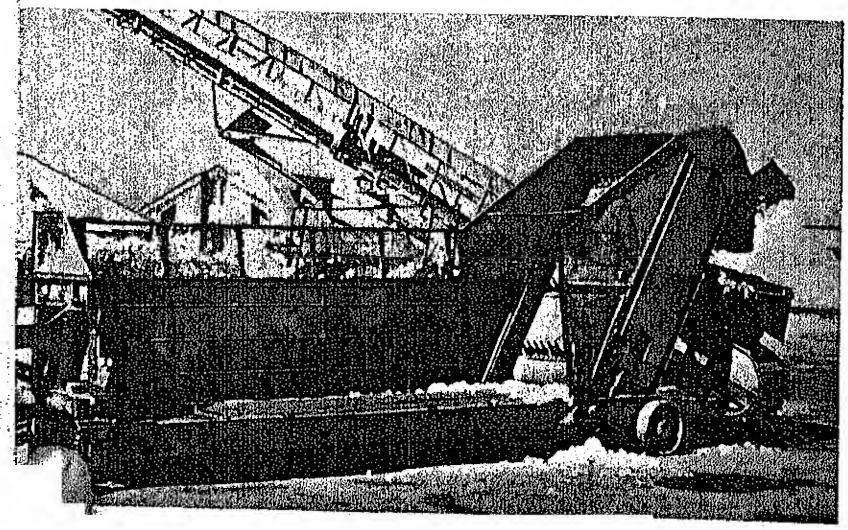
Table 18.–Cost of producing cotton on collective and state farms, 1966-70

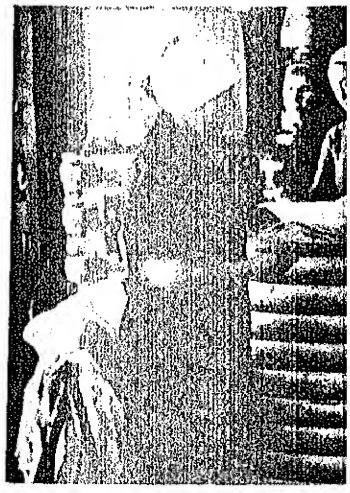
Item	Uzbekistan	Tadzhikistan	Turkmenistan	Azerbaidzhan	Kazakhstan	Kirgizia	Total USSR
	Rubles per metric ton/ unginned cotton	*Rubles per metric ton/ unginned cotton*	*Rubles per metric ton/ unginned cotton*	*Rubles per metric ton/ unginned cotton*	*Rubles per metric ton/ unginned cotton*	*Rubles per metric ton/ unginned cotton*	*Rubles per metric ton/ unginned cotton*
Collective farms:							
1966	320	343	373	379	324	281	332
1967	329	398	416	392	318	287	352
1968	338	397	403	400	388	295	357
1969	369	424	442	428	347	359	389
1970	384	434	468	450	323	331	404
State farms:							
1966	294	292	390	305	319	312	298
1967	304	296	392	358	302	324	308
1968	331	311	435	389	390	356	339
1969	368	423	442	428	347	359	389
1970	358	332	449	439	379	376	362
	Cents per pound of lint[1]	*Cents per pound of lint*[1]	*Cents per pound of lint*[1]	*Cents per pound of lint*[1]	*Cents per pound of lint*[1]	*Cents per pound of lint*[1]	*Cents per pound of lint*[1]
Collective farms:							
1966	17.08	18.30	19.91	20.23	17.29	14.96	17.72
1967	17.56	21.24	22.20	20.92	16.97	15.32	18.78
1968	18.04	21.19	21.51	21.35	20.71	15.74	19.05
1969	19.69	22.63	23.59	22.84	18.52	19.16	20.76
1970	20.49	23.16	24.98	24.01	17.24	17.66	21.56
State farms:							
1966	15.69	15.58	20.81	16.28	17.02	16.65	15.90
1967	16.22	15.80	20.92	19.10	16.12	17.29	16.44
1968	17.66	16.60	23.22	20.76	20.81	19.00	18.09
1969	19.64	22.57	23.59	22.84	18.52	19.16	20.76
1970	19.10	17.73	23.96	23.43	20.23	20.07	19.32

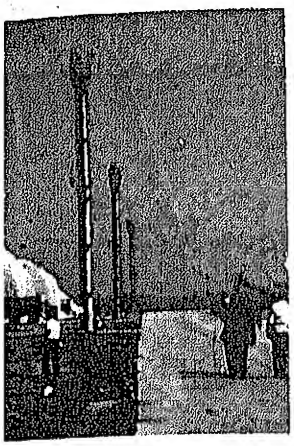
[1] Assuming 34 percent lint outturn, seed paying cost of storage at procurement center, transportation to the gin, and ginning and 1 ruble = $0.40.

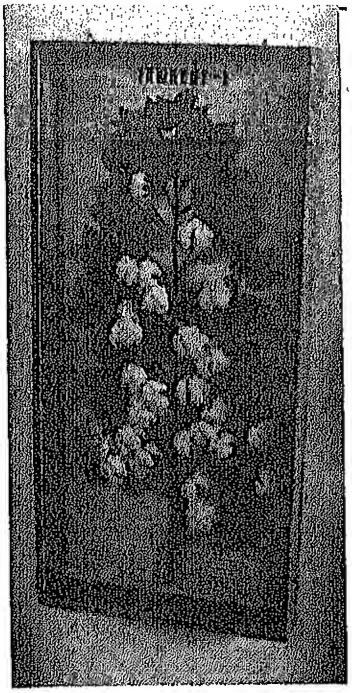


(Left) 4-row cotton picker; (below) dumping freshly picked cotton in drying area before delivery to procurement center; (lower left) machine at procurement center on which cotton is dumped before stacking (above and at right); (lower right) machine for moving cotton from stack to gin; (botton) sewing heads on cotton bales at gin.

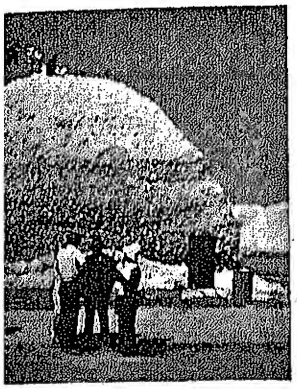


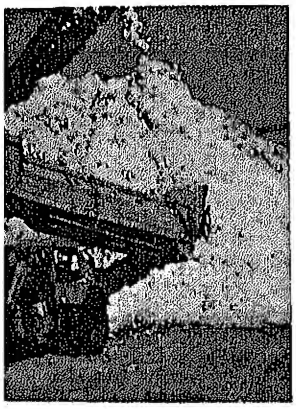






(Left) wilt resistant variety Tashkent-1; (below) sign boards showing production targets; (lower right and bottom) cotton accorded position of esteem in paintings by Soviet artists.





PRICING

As a part of each 5-year plan, the Soviet Government establishes a basic price for cotton, which remains fixed for the duration of the plan. Under the 1971-75 plan, the price per ton of seed cotton for each of the four grades of both Upland cotton and extra-long staple cotton varies considerably, depending on the efficiency with which the various areas raise cotton. In high-salinity or other relatively low-yielding areas, prices per ton are set higher than in the higher yielding areas.[3] For example, the price of Grade 1 Upland cotton ranges from 490 rubles per metric ton of unginned cotton in low-yielding areas (roughly equivalent to 26.1 cents per pound of lint[4] [5]) to as high as 615 rubles per ton of unginned cotton in high-yielding areas (roughly equivalent to 32.8 cents per pound of lint). The corresponding range for extra-long staple cotton is from 829 to 970 rubles per ton of unginned cotton (roughly equivalent to from 53.7 to 62.9 cents per pound of lint). The average price for Grade 1 Upland cotton is reported to be 546 rubles per ton and for Grade 1 extra-long staple cotton, 900 rubles per ton. (These are equivalent to roughly 29.1 and 58.3 cents, respectively, per pound of lint.) Prices for Grades 2, 3, and 4 of both Upland and extra-long staple cotton are progressively lower.

In addition to the prices which apply to all the production on state farms and to the designated "planned" production goal on collective farms, there is a price bonus for collective farms of 50 percent of the base procurement price for all above-plan production. This bonus price, which was established in 1969 to boost cotton production, was one direct cause of the bumper crop of 1970.

[3] It is the team's understanding that such differentials in prices are used for other commodities as well as cotton.

[4] The conversion of ruble values into meaningful U.S. currency equivalents is fraught with problems because there is no regular established market for the "internal ruble." Travelers must convert their dollars into rubles when traveling in the Soviet Union at a set value of $1.34, but this is known to be much higher than the typical level at which business transactions occasionally take place in Western Europe. Conversions in this report are made at the assumed level of 1 ruble = 40 U.S. cents.

[5] In the absence of any ruble farm price for cottonseed or ginning charge, these conversions assume that the seed pays the cost of storage at the procurement center, transportation to the gin, and ginning costs, and that the procurement price of unginned cotton is in substance the return for lint which is assumed to be 34 percent of the unginned or seed cotton for Upland cotton and 28 percent for extra-long staple cotton.

Table 19.—Effective range of prices for unginned cotton in low-yielding and high-yielding areas, of the USSR, 1972

Grade	Upland cotton			Egyptian-type cotton		
	Low	High	Average	Low	High	Average
	Rubles per metric tons/ of unginned cotton	*Rubles per metric tons/ of unginned cotton*	*Rubles per metric tons/ of unginned cotton*	*Rubles per metric tons/ of unginned cotton*	*Rubles per metric tons/ of unginned cotton*	*Rubles per metric tons/ of unginned cotton*
1	490	615	546	829	970	900
2	420	535	450	739	815	760
3	350	435	380	599	660	640
4	210	260	230	355	355	355
	Cents per pound of lint[1]	*Cents per pound of lint*[1]	*Cents per pound of lint*[1]	*Cents per pound of lint*[1]	*Cents per pound of lint*[1]	*Cents per pound of lint*[1]
1	26.15	32.82	29.14	53.72	62.86	58.32
2	22.41	28.55	24.01	47.89	52.81	49.25
3	18.68	23.21	20.28	38.81	42.77	41.47
4	11.21	13.87	12.27	23.00	23.00	23.00

[1] Assuming 34 percent lint outturn for Upland cotton and 28 percent for extra-long staple cotton; seed paying the cost of storage at the procurement center, transportation to the gin and ginning; and 1 ruble = $0.40.

RECLAMATION AND SOIL PROBLEMS

In each Republic visited, officials informed the team that high salinity and a high water table restricted the yields in many of the producing areas. However, they also stressed that they had been successful in continuously increasing the yields in these areas by leaching the salts below the root zone through construction of drainage systems and applications of water. Gypsum was used in some areas where high sodium content was a problem. The drainage systems seen in the fields were mostly of the open-ditch type. The team also observed some areas of high water table and high salinity where no drainage systems were apparent, and others where the present systems were inadequate for the purpose intended.

In all the Republics visited, it was evident that the USSR is pursuing a policy of developing and expanding irrigated lands by reconditioning old salted-up areas, by bringing new desert land into cultivation, and by extending irrigation into areas that formerly were nonirrigated farming areas. Some of the land, as in the Hungry Steppe area, contains soil that is high in salts including sodium and also has a high water table. In these areas, draglines were observed constructing drainage ditches to lower the water table. The leached water was either pumped to evaporation ponds or mixed with fresh water and pumped back on the land.

Other areas being newly developed, such as in the Vakhsh Valley in Tadzhikistan, contained productive soils in their natural state. These were being developed by leveling and constructing irrigation systems to supply water to the land. In some cases, this involves raising the water a considerable height so that it may then move through the area by gravity.

Cotton is being cultivated as the first crop on most of the newly developed soils regardless of whether they had been alkali and high salinity soils or high producing soils. Officials stated that ordinarily grain is not grown in the development of new lands because other Republics and areas can produce it more economically.

The team found it impossible to develop enough information within the time limits of its work schedule and travel plan to make an independent determination of the current national trend with respect to salinity of cotton soils. Clearly, salinity is a problem and the salting-up process is continuing. Corrective action is in evidence, but it was not possible for the team to determine whether on net balance the salinity problem is getting better or worse over a period of several years.

Consequently, the team has relied on the gradual expansion of cotton acreage and the rising trend in yields as indications that the salinity problem, though naturally a negative factor, is not of such magnitude and severity as to offset the various plus factors and force a net reduction in cotton production. The conclusions the team has reached reflect this as well as an implied assumption that the resources committed to various ameliorating practices will be increased as necessary over the next several years to prevent any upward trend in net salinity from causing either the acreage or yield of cotton to start trending downward.

BREEDING AND GENETICS

At all levels and phases of USSR cotton production, there was a keen appreciation for the part that plant breeding, or the development of new or improved varieties, has played and will continue to play in the Soviet cotton industry.

As in the United States, varieties of Upland type cotton (*G. hirsutum L.*) constitute the greater part of total cotton acreage. However, the acreage of varieties of the *barbadense* type (*G. barbadense L.*) is relatively greater in the USSR than in the United States. The growing of varieties of the *barbadense*, or extra-long staple, types has been especially encouraged and promoted in the Tadzhik and Turkmen Republics and in one part of Uzbekistan. The famous 108F variety developed in the USSR still is the leading Upland cotton variety. Furthermore, it serves as the check variety, or standard-of-comparison, in current cotton breeding programs.

The necessity of having varieties with a practical degree of earliness of crop maturing and the desirability of increasing earliness through the application of plant-breeding techniques can be well understood by anyone who has studied a topographical map of the USSR cotton area. Not only are these areas farther north than most other cotton regions of the world, but many of them are situated at considerably higher elevations. Thus, it is essential that to be grown successfully and

economically in the USSR, a cotton variety must be early maturing—and in the view of most people who work with the crop, the earlier the better.

For the serious Verticillium wilt disease also, the greatest hope for solution apparently lies in breeding wilt resistant varieties. Research on wilt resistance has been greatly expanded in recent years and a number of varieties reported to be Verticillium wilt resistant or tolerant have been developed and released. Chief among these are Tashkent 1, 2, and 3. Testing programs which include these varieties are reportedly in progress in all major Upland growing areas. Though there is some uncertainty as to which of the three varieties is best adapted to a particular zone or ecological area, it was generally reported that the Tashkent varieties would outyield the old standard 108F variety only on wilt-infested soils. Present interest now centers on delineating such areas of infestation so that one of the resistant varieties may be planted on them.

The Tashkent 1, 2, and 3 varieties were represented to the team as possessing a high degree of wilt resistance. A "wild" stock of cotton called *G. Mexicanum* (botanically, *G. hirsutum L.* var. *Mexicanum*) contributed germ plasm to these varieties through the hybridization of *G. Mexicanum* with certain Soviet varieties of Upland cotton.

Plant breeders also place fiber quality high on the list of priorities for character maintenance and improvement. In briefings held at fiber testing laboratories of several plant breeding institutes, the team understood that all plant breeders were alert to the textile requirements at the spinning and weaving level and that special attention is being paid to such raw cotton fiber properties as length, strength, fineness, and elongation in all breeding and selection programs.

Prior to the advent of the Tashkent varieties, Upland cottons were bred, maintained, and improved by selection and reselection within introduced stocks (agricultural varieties). Over the years, these varieties, among them 108F, no doubt have become so well differentiated genetically that biologically they are now sufficiently distinct from the old American Upland cotton from which they were originally extracted to be termed "Russian Uplands."

Breeding work on the extra-long staple cotton, belonging to the species *G. barbadense L.*, got underway 10 to 15 years after the work on Upland began. Stocks were imported from the United States, Egypt, and Peru and selection was carried out, particularly at stations in Turkmenistan and Tadzhikistan. Here climatic conditions were thought to be most favorable of any location in the Soviet Union for longer staple cottons and where, in fact, the greater part of Soviet ELS cotton is grown.

As in the case of Upland cottons, earliness of crop maturity is a desirable characteristic in ELS cotton and Soviet breeders have placed strong selection pressure on this character. As a result, ELS varieties have developed very short fruiting branches and have a more slender or upright and considerably more compact growth habit than the *G. barbadense L.* varieties grown in the United States and other countries.

Characteristically, the *G. barbadense L.* cottons are more tolerant to Verticillium wilt than are most Uplands. However, wilt symptoms were observed on ELS cotton in a number of fields on the farms visited and breeding work is being conducted to develop greater wilt resistance. Certain sub-species or primitive types of *G. barbadense L.* cottons are being used in the breeding program as parental material for crosses with local ELS varieties.

The Soviet plant breeders often mentioned the collection of wild species and sub-species that have been accumulated beginning with Vavilov's expedition to Mexico in the 1920's. Consideration is being given to the use of interspecific hybridization in their breeding programs.

At the Plant Breeding Institute in Dushanbe, mention was made of the utilization of the hybrid vigor found in F_1 crosses between Upland and *G. barbadense L.*. Seeds were produced by hand pollination and yield increases ranging up to 50 percent were reported. However, the team saw no hybrid cotton, either on experimental stations or on the farms visited. In view of the labor and expense involved in the production of hybrid seed by hand pollination, the team is confident that such cottons are not being produced on a practical or commercial scale.

Table 20.—Area planted to various varieties of cotton, USSR, 1964-71, in hectares

Varieties	1964	1965	1966	1967	1968	1969	1970	1971
	1,000 hectares	*1,000 hectares*	*1,000 hectares*	*1,000 hectares*	*1,000 hectares*	*1,000 hectares*	*1,000 hectares*	*1,000 hectares*
Upland varieties:								
108 F	1,707.2	1,527.0	1,344.9	1,148.1	1,164.2	1,090.6	1,097.8	882.1
S - 4727	189.9	254.4	297.7	320.5	326.0	394.4	353.1	387.2
159 F	—	—	—	.2	1.0	12.9	144.4	332.7
153 F	16.9	91.0	235.7	364.6	361.3	360.3	351.3	215.6
133	(1)	(1)	36.0	80.8	82.8	158.4	176.8	185.3
138 F	210.9	176.4	179.4	115.6	98.0	109.9	103.8	109.1
Tashkent 2	—	—	—	—	—	.2	3.9	104.3
149 F	57.8	84.2	113.3	131.8	115.1	128.9	125.9	77.1
2833	(1)	(1)	8.4	22.1	28.1	54.1	65.3	74.2
Tashkent 1	—	—	—	—	—	.1	2.9	63.9
Tashkent 3	—	—	—	—	—	.1	1.1	26.7
2421 Improved	77.8	53.2	39.7	28.8	36.3	34.4	35.5	22.0
152 F	(1)	(1)	7.0	12.5	11.9	18.9	8.8	.4
Miscellaneous (incl. new varieties)	50.5	60.1	39.3	13.5	9.3	11.8	9.9	5.8
Total Upland	2,311.0	2,250.3	2,301.4	2,238.5	2,234.0	2,375.0	2,480.5	2,486.4
Egyptian type varieties:								
5904 I	55.1	62.3	66.0	74.6	75.5	58.1	69.3	57.1
5595 I	27.7	45.0	38.3	42.8	43.3	38.0	49.5	52.5
8763 I	18.9	20.0	24.2	43.3	42.3	34.7	67.2	51.0
S - 6030	—	—	—	—	.1	1.0	18.5	40.7
9078 I	34.9	57.3	24.7	27.4	39.6	20.5	40.2	40.2
9155 I	(1)	(1)	1.4	7.8	3.6	3.7	4.5	23.4
6465 V	—	—	—	.1	.8	4.4	12.3	10.9
9647 I	—	—	—	—	—	—	.2	2.3
Miscellaneous (incl. new varieties)	13.4	6.5	6.6	7.2	6.0	4.4	3.6	5.9
Total Egyptian type	150.0	191.1	161.2	203.2	211.2	164.8	265.3	284.0
Total all varieties[2]	2,461.0	2,441.4	2,462.6	2,441.7	2,445.2	2,539.8	2,745.8	2,770.4

[1] If any, included in Miscellaneous.
[2] Totals do not correspond exactly with data in Table 1.

Table 21.—Area planted to various varieties of cotton, USSR, 1964-71, in acres

Varieties	1964	1965	1966	1967	1968	1969	1970	1971
	1,000 acres	*1,000 acres*	*1,000 acres*	*1,000 acres*	*1,000 acres*	*1,000 acres*	*1,000 acres*	*1,000 acres*
Upland varieties:								
108 F	4,218.5	3,773.2	3,323.2	2,836.9	2,876.7	2,694.9	2,712.7	2,179.7
S-4727	469.2	638.5	735.6	791.9	805.5	974.6	872.5	956.8
159-F	—	—	—	.5	2.5	31.9	356.8	822.1
153-F	41.8	224.9	582.4	900.9	892.8	890.3	868.1	532.7
133	(1)	(1)	89.0	199.7	204.6	391.4	436.9	457.9
138 F	521.1	435.8	443.3	285.6	242.2	271.6	256.5	269.6
Tashkent 2	—	—	—	—	—	.5	9.6	257.7
149 F	142.8	208.1	280.0	325.7	284.4	318.5	311.1	190.5
2833	(1)	(1)	20.8	54.6	69.4	133.7	161.3	183.3
Tashkent 1	—	—	—	—	—	.2	7.2	157.9
Tashkent 3	—	—	—	—	—	.2	2.7	66.0
2421 Improved	192.2	131.5	98.1	71.2	89.7	85.0	87.7	54.4
152 F	(1)	(1)	17.3	30.9	29.4	46.7	21.7	1.0
Miscellaneous (incl. new varieties)	124.8	148.5	97.1	33.4	23.0	29.1	24.5	14.3
Total Upland	5,710.4	5,560.5	5,686.8	5,531.3	5,520.2	5,868.6	6,129.3	6,143.9
Egyptian type varieties:								
5904-I	136.4	154.0	163.1	184.3	186.6	143.5	171.3	141.1
5595-I	68.5	111.1	94.6	105.8	107.0	93.9	122.3	129.7
8763-I	46.7	49.4	59.8	107.0	104.5	85.7	166.1	126.0
S-6030	—	—	—	—	.2	2.5	45.7	100.6
9078-I	86.2	141.6	61.0	67.7	97.9	50.7	99.3	99.3
9155-I	(1)	(1)	3.5	19.3	8.9	9.1	11.1	57.8
6465-V	—	—	—	.2	2.0	10.9	30.4	27.0
9647-I	—	—	—	—	—	—	.5	5.7
Miscellaneous (incl. new varieties)	33.1	16.1	16.3	17.8	14.8	10.9	8.9	14.6
Total Egyptian type	370.7	472.2	398.3	502.1	521.9	407.2	655.6	701.8
Total all varieties[2]	6,081.1	6,032.7	6,085.1	6,033.4	6,042.1	6,275.8	6,784.9	6,845.7

[1] If any included in Miscellaneous. [2] Totals do not correspond exactly with data in Table 1.

Table 22.—Technical properties of various varieties of cotton

Varieties	Staple length, mm.	Uniformity index	Metric number (fineness)	Breaking load strength of fiber in grams	Length at break KM
Upland varieties:					
108 F	32.1	1160	5620	4.6	25.8
S-4727	32.9	1210	5600	4.6	25.7
159 F	33.0	1220	5800	4.4	25.5
153 F	31.9	1290	5160	4.7	24.2
133	36.5	1170	6700	4.7	31.4
138 F	36.3	1110	6180	4.5	27.8
Tashkent 2	32.9	1220	5420	4.5	24.4
149 F	35.7	1170	6240	4.4	27.4
2833	32.8	1080	5440	4.6	25.0
Tashkent 1	32.5	1260	5320	4.6	24.4
Tashkent 3	32.3	1260	5720	4.5	25.7
2421 Improved	33.4	1230	5510	4.7	25.9
Egyptian type varieties:					
5904-I	37.0	1150	5740	5.4	30.6
5595-I	37.9	1200	7090	4.7	33.3
8763-I	39.8	1350	7510	4.6	34.4
S-6030	41.7	1270	8240	4.1	33.8
9078-I	38.5	1180	7710	4.3	33.2
9155-I	40.0	1280	7630	4.5	34.3
6465-V	39.6	1160	7080	4.4	31.2
9647-I	40.6	1360	8320	4.4	36.8

PLANTING SEED

The varieties of cotton to be grown in the various zones or regions of the USSR are determined by officials of the Ministry of Agriculture, USSR, after consultation with specialists in the various institutes and experimental stations. Agronomists and other specialists on the state and collective farms are also consulted. Having determined the variety or varieties to be grown in each of the zones, and the quantities of seed that will be required for the following year, each farm approved for raising planting seed is given its goal. In total, there are 80 collective and state farms that raise elite planting seed and they receive a premium price for their cotton.

Foundation or nucleus seeds are supplied to the seed increase farms by the experimental stations. The planting seed increases are grown on some of the best land available, and as has been mentioned, the fields that are to produce the planting seed crop are harvested by hand. Special care is taken to make sure the cotton is dry when picked. The ginning is done at specially designated planting seed gins. Following ginning, first-cut linters are removed on linter saw stands. There is interest in removing all linters from planting seed, but acid delinting facilities are not available and experience to date indicates that mechanical delinting does considerable damage to the seed. A copper seed-disinfecting compound is applied to planting seed before it is bagged, stacked, and stored to await distribution to the production farms in the spring.

Descriptions of some of the leading Upland and fine-stapled varieties of cotton as reported by the Soviets in an English language folio, "Cotton Varieties of Uzbekistan," published in Tashkent, 1966, are presented with minor editing in the Appendix of this report.

STORING AND GINNING

Cotton shifts out of the farm domain and enters the industrial domain when it moves on the conventional universal trailers from the farm where grown to the local procurement center. Procurement centers, gins, and the activities related to them come within the jurisdiction of the Ministry of Light Industry rather than the Ministry of Agriculture. There were 139 gins and some 654 procurement centers in 1970. Each gin serves the dual function of procurement center and gin. In addition, a gin typically also receives the cotton from three other procurement centers, located at outlaying points.

On arrival at the procurement center, the cotton is sampled, graded, and weighed. Seed cotton intended for planting seed is kept separate and given special handling. Both procurement centers and gins typically are equipped with dryers so additional drying can be done if needed. The cotton is distributed by homogeneous lots—stacks—that take into account grade, variety, and type of picking. Upon arrival at the procurement center, high moisture cotton can either be dried so it can be stored in the large stacks or held in sheds or in low stacks for a comparatively short period until it can be moved to the gin. In general, only low moisture cotton would be put in large stacks and held for prolonged periods before ginning.

The stacks, which are formed on raised asphalt or concrete bases, are typically about 80 feet long, 45 feet wide, and 30 feet high, and hold from 300 to 500 metric tons of seed cotton (about 500 to 800 bales). Specialized machines are used both in forming the stacks and in breaking the cotton out of them. Each procurement center handles from 10,000 to 14,000 tons (about 16,000 to 22,000 bales).

A large amount of labor is expended in unloading, stacking, and covering the cotton and then in the movement of the cotton from stack to gin. Cotton is moved from the stack to the gin by pneumatic pipe in the case of those procurement centers located at gins. In the case of outlying procurement centers, motor trucks are used to haul the cotton to the gin.

The gins visited were powered by electricity and equipped with seed cotton cleaners, belt distributors, and 80-saw gin stands. Contrary to the practice in the United States where linters are removed from cotton seed at the oil mills, in the USSR a single (or first) cut of linters is taken at the ginning plant immediately after the ginning operation (removal of lint from seed). Special linter-saw machines (similar to those used at U.S. oil mills) are used for this purpose. These are located in a room or building adjacent to the main gin room.

Labor requirements are high by U.S. practice. Normally, a gin crew consists of 18-20 people. Gins run three 7-hour shifts per day and operate 10 to 11

months per year. Soviet cotton bales, which average about 485 pounds net weight, are wrapped in either light jute or cotton bagging.

The bagging of bales observed consisted of a 5.5 ounce per square yard of nonwoven cotton web of the type produced on the Maliwatt machine and stitched with tricot-type stitches, 10 rows per inch. One small sample analyzed appeared to be produced from low-grade short staple cotton or from reasonably good quality cotton textile mill waste. It was sewed with a good quality cotton thread. The patterns placed in the press cover the four sides of the bale and heads are sewn on by hand after the bale is removed from the press.

The bales measure 37 inches long, 30 inches wide, and 24 inches deep and range in weight from 180 to 240 kilograms (from 397 to 529 pounds.). They are tied with 9 to 11 wires or bands and have a density of about 27 pounds per cubic foot. Extra-long staple cotton was reported to be mostly ginned on roller gins of which the team was told that there are eleven 12-stand installations in the Soviet Union.

Table 23.–Cotton ginnings in USSR, by Republics, calendar years 1960-70

Year	Uzbekistan	Tadzhikistan	Turkmenistan	Azerbaidzhan	Kazakhstan	Kirgizia	Total USSR[1]
	1,000 metric tons of lint	*1,000 metric tons of lint*	*1,000 metric tons of lint*	*1,000 metric tons of lint*	*1,000 metric tons of lint*	*1,000 metric tons of lint*	*1,000 metric tons of lint*
1960	1,092	137	123	104	32	48	1,545
1961	1,055	147	123	120	28	44	1,532
1962	1,048	158	121	80	29	46	1,492
1963	1,012	152	126	85	25	46	1,455
1964	1,232	184	152	105	24	59	1,762
1965	1,274	195	150	119	33	60	1,837
1966	1,325	202	175	118	35	59	1,910
1967	1,410	216	187	119	37	65	2,032
1968	1,415	213	186	127	33	63	2,041
1969	1,314	217	174	129	30	59	1,919
1970	1,443	225	223	131	37	60	2,128
	1,000 bales, 480 lb. net	*1,000 bales, 480 lb. net*	*1,000 bales, 480 lb. net*	*1,000 bales, 480 lb. net*	*1,000 bales, 480 lb. net*	*1,000 bales, 480 lb. net*	*1,000 bales, 480 lb. net*
5,015	5,015	629	565	478	147	220	7,096
1961	4,846	675	565	551	129	202	7,036
1962	4,813	726	556	376	133	211	6,853
1963	4,648	698	579	390	115	211	6,683
1964	5,658	845	698	482	110	271	8,093
1965	5,851	896	689	547	152	276	8,437
1966	6,068	928	804	542	161	271	8,772
1967	6,476	992	859	547	170	299	9,333
1968	6,499	978	854	583	152	289	9,374
1969	6,035	997	799	592	138	271	8,814
1970	6,628	1,033	1,024	602	170	276	9,774

[1] Total for entire USSR does not generally agree with the total for the producing Republics.

Table 24.—Cotton ginnings in USSR, by quarters on calendar year and July-June basis, 1960-72

Year	Calendar year					Year beginning July 1				
	Jan.-Mar.	Apr.-June	July-Sept.	Oct.-Dec.	Total	July-Sept.	Oct.-Dec.	Jan.-Mar.	April-June	Total
	1,000 metric tons of lint	*1,000 metric tons of lint*	*1,000 metric tons of lint*	*1,000 metric tons of lint*	*1,000 metric tons of lint*	*1,000 metric tons of lint*	*1,000 metric tons of lint*	*1,000 metric tons of lint*	*1,000 metric tons of lint*	*1,000 metric tons of lint*
1960	—	—	—	—	1,545	—	—	—	—	—
1961	419	302	225	586	1,532	225	586	427	326	1,564
1962	427	326	171	568	1,492	171	568	429	294	1,462
1963	429	294	159	573	1,455	159	573	484	450	1,666
1964	484	450	244	584	1,762	244	584	503	462	1,793
1965	503	462	292	580	1,837	292	580	536	492	1,900
1966	536	492	(882)		1,910	(882)		563	527	1,972
1967	563	527	332	610	2,032	332	610	(1,107)		2,049
1968	(1,107)		287	647	2,041	287	647	479	528	1,941
1969	479	528	271	641	1,919	271	641	570	508	1,990
1970	570	508	328	722	2,128	328	722	658	618	2,326
1971	658	618	343	740	2,359	343	740	649	630	2,362
1972	649	630	(1,080)		2,359	(1,080)		—	—	—
	1,000 bales/ 480 lb. net	*1,000 bales/ 480 lb. net*	*1,000 bales/ 480 lb. net*	*1,000 bales/ 480 lb. net*	*1,000 bales/ 480 lb. net*	*1,000 bales/ 480 lb. net*	*1,000 bales/ 480 lb. net*	*1,000 bales/ 480 lb. net*	*1,000 bales/ 480 lb. net*	*1,000 bales/ 480 lb. net*
1960	—	—	—	—	7,096	—	—	—	—	—
1961	1,924	1,387	1,033	2,692	7,036	1,033	2,692	1,961	1,497	7,183
1962	1,961	1,497	785	2,610	6,853	785	2,610	1,970	1,350	6,715
1963	1,970	1,350	730	2,633	6,683	730	2,633	2,223	2,067	7,653
1964	2,223	2,067	1,121	2,682	8,093	1,121	2,682	2,310	2,122	8,235
1965	2,310	2,122	1,341	2,664	8,437	1,341	2,664	2,461	2,260	8,726
1966	2,461	2,260	(4,051)		8,772	(4,051)		2,586	2,420	9,057
1967	2,586	2,420	1,525	2,802	9,333	1,525	2,802	(5,084)		9,411
1968	(5,084)		1,318	2,972	9,374	1,318	2,972	2,200	2,425	8,915
1969	2,200	2,425	1,245	2,944	8,814	1,245	2,944	2,618	2,333	9,140
1970	2,618	2,333	1,506	3,317	9,774	1,506	3,317	3,022	2,838	10,683
1971	3,022	2,838	1,575	3,400	10,835	1,575	3,400	2,981	2,894	10,850
1972	2,981	2,894	(4,960)		10,835	(4,960)		—	—	—

TECHNICAL PROPERTIES OF SOVIET COTTON[6]

Lint cotton is classed and graded according to USSR State Standard 3279-51 into two groups, Upland (*G. hirsutum*) and fine staple (*G. barbadense*). Each group is then subdivided into seven grades, all according to four technical tests of quality: for fiber strength, maturity, trash, and moisture. The tests are made by taking samples of 100 grams (0.22 lb.) from not less than an inch under the surface of the cotton in each tenth bale of the group or lot of bales to be sampled. The samples are then mixed so as to obtain an average sample of 100 grams for the entire lot which is then tested. The instruments and methods are much different from those in the United States.

The first element in determining the grade—fiber strength—is calculated as the breaking load per single fiber in tests in which there is a 3 mm. space between jaws of the dynanometer.

Second element is determined by microscopic examination of 250 fibers in which the fibers are classed into 11 groups according to maturity, ranging from 5.0 for absolutely mature down to 0.0 for

[6]Based largely on "Cotton Growing and Ginning in the USSR," V/O "Exportljon" Moscow, USSR [1966 or 1967] and "The World's Cottons: A Summary of Cotton Fiber and Processing Test Results," by Robert B. Evans, USDA, FAS-M-250, March 1973.

absolutely immature. The ratio of the width of the fiber to the thickness of the canal is stated as characterizing the maturity of the fiber.

The third element of grade—defects and trash content—includes the percentage of cotton with "convolutions, strings, conjoint defects, motes, broken seeds and dead fiber." In case of dispute, defects and impurities are actually picked out by hand with tweezers.

The fourth element is moisture content.

It is reported that if a lot of Pervyi-I grade cotton is found to have 2.4 percent defects and trash instead of the allowable 2.1 percent, the invoice weight will be reduced by 0.3 percent. In other words, adjustments for defects and trash are made very much as is done elsewhere for moisture content.

Color is not taken into account in determining quality. Provided a shipment meets the fixed specifications for tensile strength, maturity, defects, trash, and moisture content it can be delivered spotted, tinged, creamy, or even blue. However, taking into account the Western concept of classification, the Soviets are reported by a European source to strive not to deliver any other cotton than white against contracts for sale of Otbornyi (Extra) and Pervyi-I into Western European markets.

In "*Cotton Growing and Ginning in The USSR*" staple length is defined as "the mean length of all lengths exceeding the modal length of the sample . . . thus the staple length, depending on fiber length and uniformity of the test sample, exceeds the modal length by 3.0 - 4.0 mm. as a rule." According to another source[7] "the classer's length (not determined for the VI sort of cotton) in the interpretation of Soviet standards is almost the length of the longest fibers, due to which it approaches the spinning length."

The USSR, like the United States, classifies cotton both by grade and by staple length. A typical quotation is for Pervyi 31/32 mm. cotton. According to Western sources Otbornyi (Extra) is scarce but it and Pervyi-I grade accounted for half or more of the USSR's cotton production in most recent years.

Another 20 percent was Vtoroy-II cotton. As for staple lengths, more than half was 31/32 mm. and another fifth to a sixth in most years was 32/33 mm.

Relationships between U.S. and USSR staple lengths and grades, according to Soviet sources, are shown in an accompanying table. The grade comparisons raise a question because U.S. standard samples are prepared for visual comparison and tests on such "biscuits" might give rise to misleading results. Also, the Soviet figures for trash content of U.S. cotton do not seem to agree with U.S. sources. Tests performed over the years in the United States indicate that Strict Low Middling has a 3.0 percent non lint content compared to 6 percent for what is said to be the USSR equivalent of this grade. As for Good Ordinary, U.S. figures give 6.7 percent, while the Soviet figure is 20 percent.

Results of tests on 12 samples of Pervyi-I 31/32 mm. indicated staple lengths ranging from 1-1/32" to 1-3/32" with the average 1-1/16". The samples produced picker and card waste ranging from what would be considered typical for U.S. Strict Middling to below Low Middling with the average around Strict Low Middling. Yarn strength was average and yarn imperfections low to average.

The samples of the lower grades of USSR cotton had low Micronaires 2.5 to 2.8, and 16 to 20 percent non-cotton content.

[7]Doberczak, A., Dowgielewicz, St., and Zurek, W., "Cotton, Bast and Wool Fibers" Warsaw, Poland, 1964.

Table 25.—Characteristics of four grades of seed cotton, USSR

Grade	Breaking load, strength of fiber in grams	Trash content limit	Moisture content	
			Central Asia	Trans-caucasus
	Not less than	*Percent*	*Percent of dry weight*	*Percent of dry weight*
First I	4.4	0.5	8.0	9.0
Second II	3.9	1.0	10.0	11.0
Third III	3.2	1.9	11.0	12.0
Fourth IV	3./and less	3.6	13.0	14.0

Table 26.—Amount and grades of seed cotton (unginned) purchases in USSR, 1959-71

Crop year	Total purchased	Percentage distribution of purchases by grades				
		Grade I	Grade II	Grade III	Grade IV	Total
	1,000 metric tons	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
1959	4,646	68.8	13.9	7.6	9.7	100.0
1960	4,289	67.7	11.6	6.5	14.2	100.0
1961	4,518	65.0	15.6	8.5	10.9	100.0
1962	4,304	64.3	17.9	6.3	11.5	100.0
1963	5,210	67.2	13.0	7.2	12.6	100.0
1964	5,286	56.5	15.8	10.4	17.3	100.0
1965	5,660	64.6	16.9	9.2	9.3	100.0
1966	5,981	55.4	18.2	13.9	12.5	100.0
1967	5,970	55.1	18.5	14.5	11.9	100.0
1968	5,945	60.9	14.9	12.5	11.7	100.0
1969	5,708	50.4	15.4	14.5	19.7	100.0
1970	6,890	60.9	16.8	13.6	8.7	100.0
1971	7,101	54.7	18.5	17.6	9.2	100.0

Table 27.—USSR upland cotton classified by staple length, 1960-70

Crop year	Below 27/ 28 mm.	28/29	29/30	30/31	31/32	32/33	33/34	34/35	35/36 and more	35/36	36/37	37/38 and longer
	Percent of total	*Percent of total*	*Percent of total*	*Percent of total*	*Percent of total*	*Percent of total*	*Percent of total*	*Percent of total*	*Percent of total*	*Percent of total*	*Percent of total*	*Percent of total*
1960	(1)	0.9	1.4	15.2	55.8	15.5	0.7	5.7	4.8	—	—	—
1961	(1)	.5	1.6	14.0	49.6	17.5	2.9	7.3	6.6	—	—	—
1962	—	.1	.8	12.9	56.4	16.9	1.2	3.5	8.2	—	—	—
1963	—	.1	.8	8.5	61.0	16.0	1.2	3.6	8.8	—	—	—
1964	—	(1)	.6	6.3	58.5	22.1	.7	3.9	7.9	—	—	—
1965	—	(1)	.9	13.2	55.2	16.4	1.1	5.1	—	6.0	2.0	.1
1966	—	(1)	.8	6.0	60.6	17.4	1.1	6.2	—	6.0	1.6	.3
1967	—	(1)	.5	5.1	62.2	16.0	1.8	6.4	—	5.1	2.3	.6
1968	(1)	—	.5	4.0	67.2	12.6	1.9	6.1	—	5.8	1.8	.1
1969	—	—	.1	2.8	61.7	15.5	2.5	5.3	—	9.7	2.0	.4
1970	—	(1)	.2	1.9	60.7	20.2	1.7	5.2	—	8.2	1.8	.1

[1] Less than 0.05 percent.

Table 28.—USSR Egyptian-type cotton, classified by staple length 1960-70

Crop year	33/34 and shorter	34/35	35/36	36/37	37/38	38/39	39/40	40/41	41/42	42/43 and longer
	Percent of total	*Percent of total*	*Percent of total*	*Percent of total*	*Percent of total*	*Percent of total*	*Percent of total*	*Percent of total*	*Percent of total*	*Percent of total*
1960	0.4	4.0	41.5	14.2	18.3	15.4	1.1	2.6	2.5	—
1961	.4	4.2	48.3	9.7	18.9	10.9	2.5	2.7	2.4	(1)
1962	.4	4.7	53.5	11.1	11.4	11.0	2.5	2.5	2.0	.9
1963	1.1	3.1	47.6	17.8	14.0	10.6	2.8	1.9	.8	.3
1964	.8	3.9	31.4	19.5	25.4	8.7	4.3	2.3	3.4	.3
1965	.4	3.6	31.0	19.5	26.6	8.9	4.3	4.1	1.6	—
1966	.2	4.3	26.1	30.8	18.6	7.9	6.6	5.0	.5	—
1967	1.0	5.7	21.0	30.6	24.3	2.5	7.0	6.9	.9	.1
1968	.3	3.0	23.5	28.7	30.6	5.1	3.7	4.8	.2	.1
1969	1.0	3.2	19.8	30.3	25.3	6.7	8.1	5.1	.5	(1)
1970	1.2	3.5	10.7	30.7	29.3	7.5	7.6	8.4	.9	.2

[1] Less than 0.05 percent.

Table 29.–Distribution of lint cotton by grades, 1960-1970

Crop year	0[1]-I[2]	II[3]	III[4]	Total of 0 - III	IV[5]	V[6]	VI[7]	Total
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
1960	57.8	19.4	5.2	82.4	3.6	4.2	9.8	100.0
1961	58.8	20.5	5.6	84.9	4.2	5.8	5.1	100.0
1962	57.1	23.2	4.9	85.2	3.3	4.3	7.2	100.0
1963	57.9	20.0	6.6	84.5	3.8	4.6	7.1	100.0
1964	47.7	23.1	7.5	78.3	5.0	7.0	9.7	100.0
1965	55.2	23.3	8.6	87.1	4.1	4.2	4.6	100.0
1966	50.5	22.7	9.6	82.8	6.1	7.2	3.9	100.0
1967	48.4	22.6	10.6	81.6	5.9	6.5	6.0	100.0
1968	52.9	21.0	9.3	83.2	5.4	5.3	6.2	100.0
1969	37.2	21.3	13.1	71.6	7.5	8.2	12.7	100.0
1970	52.9	22.8	10.0	85.7	5.6	4.6	4.1	100.0

[1] Otbornyi-Extra 0.
[2] Pervyi - I.
[3] Vtoroy - II.
[4] Tretyi - III.
[5] Chetvertyi - IV.
[6] Pyatyi - V.
[7] Shestoy - VI.

Table 30.–Characteristics of industrial grades of lint cotton, USSR

Grade	Fiber breaking strength[1]	Maturity index[2]	Defects and trash content[3]	Moistrue content
	Grams	*Index*	*Percent*	*Percent*
Otbornyi-Extra 0	4.9 and over	2.1 and over	1.9	8
Pervyi - I	4.4 - 4.8	2.0	2.1	8
Vtoroy - II	3.9 - 4.3	1.8	2.6	9
Tretyi - III	3.4 - 3.8	1.6	3.5	10
Chetvertyi - IV	3.0 - 3.3	1.4	5.3	11
Pyatyi - V	2.5 - 2.9	1.2	8.6	12
Shestoy - VI				
XB 6	—		—	—
XC 6	Less than	Less than	12.5	12
XH 6	2.5	1.2	—	—

[1] Average breaking strength per individual fiber.
[2] As determined by microscopic examination of fibers to determine number of individual fibers that are mature, half mature, immature, or dead. 5.0 indicates absolute maturity, fibers 0.0 indicates absolute immaturity.
[3] Percentage of cotton with "convolutions, strings, conjoint defects, motes, broken seeds, dead fiber," as well as "hulls, hull fibers, fine trash and neps." Estimated by using Shirley Analyzer but in case of dispute, defects and impurities are picked out with tweezers, according to a Western European source.

Compiled from "Cotton Growing and Ginning in the USSR" published by v/o "Exportljon," Moscow.

Table 31.—Fiber and spinning test results on samples of specified USSR Pervyi-I Cotton and U.S. classer's grade and staple descriptions[1]

Item	Unit	Average results	Range results
Fiber test results:			
Fiber length:			
2.5 percent span	inches	1.05	1.03-1.08
Uniformity, 50/2.5	percent	48	47-50
Micronaire	reading	4.8	4.2-5.0
Fiber strength:			
Zero gage	mpsi	79	77-82
1/8 inch gage	gm/tex	23.0	22.6-23.5
Elongation:			
1/8 inch	percent	7.2	6.9-7.7
Nonlint content	percent	4.5	2.9-6.2
Cotton, raw cotton:			
Grayness	number	0	0-1
Yellowness	number	4	3-5
Composite	index	105	103-107
Spinning test results:			
Picker and card waste	percent	6.0	4.1-7.4
Carded yarn:			
Strength:			
22s	pounds	110	101-116
50s	pounds	39	37-42
Elongation:			
22s	percent	7.2	6.9-7.7
50s	percent	6.1	5.4-6.5
Appearance:			
22s	index	111	90-130
50s	index	92	70-100
Imperfections:			
22s	number	18	7-31
50s	number	13	5-23
U.S. classer's grade	percent of samples		
Middling White		—	92
Middling Lt. Spot		—	8
U.S. classer's staple length	percent of samples		
1-1/16"		—	75
1-3/32"		—	25

[1] 12 samples of Pervyi-I cotton, 31/32 mm. Samples obtained in import markets.

Table 32.–Average of fiber and spinning test results on samples of specified USSR cottons, and U.S. classer's grade and staple descriptions

Item	Unit	Grade, number of samples, where obtained				
		Vtoroy II 1 sample from an import market	Chetvertyi IV 2 samples from an import market	Pyatyi V 2 samples from an import market	Shestoy XB 6 2 samples from an import market	Shestoy XC 6 2 samples from an import market
Fiber test results:						
Fiber length:						
2.5 percent span	inches	1.03	-1.08-	1.00 - 101	.99 - 1.00	.99 - 1.00
Uniformity, 50/2.5	percent	44	45 - 46	-40-	-40-	39 - 40
Micronaire	reading	4.1	3.1 - 3.3	2.7 - 2.8	-2.6-	2.5 - 2.6
Fiber strength:						
Zero gage	Mpsi	78	72 - 73	71 - 75	73 - 75	74 - 77
1/8 inch gage	gm/tex	22.8	21.0 - 21.5	19.7 - 20.1	19.6 - 20.8	21.1 - 23.2
Elongation:						
1/8 inch	percent	6.6	8.3 - 8.5	7.0 - 7.3	7.2 - 7.5	6.9 - 7.5
Nonlint content	percent	7.0	6.2 - 8.1	-16.0-	17.0 - 19.7	-16.2-
Color, raw cotton:						
Grayness	number	0	2.3	-4-	5 - 6	-6-
Yellowness	number	4	-5-	-4-	-6-	-6-
Composite	index	104	96 - 99	-89-	79 - 81	-80-
Spinning test results:						
Picker and card waste	percent	8.7	5.5 - 6.1	-10.5-	12.1 - 13.5	-14.0-
Carded yarn:						
Strength:						
8s	pounds	—	—	-305-	289 - 300	-298-
22s	pounds	109	103 - 107	-92-	87 - 89	-88-
50s	pounds	36	36 - 38	—	—	—
Elongation:						
8s	percent	—	—	-7.4-	7.4 - 7.7	-6.9-
22s	percent	6.9	8.0 - 8.5	-6.9-	-6.6-	-6.1-
50s	percent	5.5	6.5 - 6.7	—	—	—
Appearance:						
8s	index	—	—	-60-	-60-	-60-
22s	index	110	-100-	-60-	-60-	-60-
50s	index	80	-70-	—	—	—
Imperfections:						
8s	number	—	—	-24-	22 - 33	-29-
22s	number	27	29 - 33	-19-	17 - 22	-20-
50s	number	29	20 - 28	—	—	—
U.S. classer's grade	percent of samples					
Middling		100	—	—	—	—
SLM		—	—	—	—	—
LM		—	—	—	—	—
M. Lt. Sp.		—	—	100	—	—
SLM Lt. Sp.		—	50	—	—	—
LM Lt. Sp.		—	50	—	—	—
LM Sp		—	—	—	50	—
BG		—	—	—	50	100
U.S. classer's staple length	percent of samples					
1"		—	—	100	100	—
1 - 1/32"		100	—	—	—	—
1 - 1/16"		—	100	—	—	—

Table 33.—Soviet equivalents of U.S. standards for staple lengths and grades

Staple lengths[1]		Grades[2]		
U.S. standard	Soviet standard	U.S. standard White cotton	Corresponding grade of Soviet cotton	
			Grade	Trash content
Inches	*Mm.*			*Percent*
15/16	27/28	Good Middling	I	1.5
31/32	28/29	Strict Middling	II	2.6
1	29/30	Middling	II	3.2
1-1/32	30/31	Strict Low Mid.	III	6.0
1-1/16	31/32	Low Middling	IV	10.0
1-3/32	32/33	Strict Good Ordinary	IV	15.0
1-1/8	33/34	Good Ordinary	V	20.0
1-5/32	34/35			
1-3/16	35/36			
1-7/32	36/37			
1-1/4	37/38			
1-7/16	39/40			
1-1/2	40/41			

[1] Based on instrument fiber tests.
[2] Established by "comparing standard samples of white lint cotton of U.S. standards issued in 1956 with standard samples of Soviet lint cotton of USSR standard 32.79-46 and grade characteristics as specified by USSR Standard 3279-51." From pp. 31, 32, "Cotton Growing and Ginning in the U.S.S.R.," v/o "Exportljon," Moscow.

FOREIGN TRADE IN COTTON

The USSR typically carries on a sizable international trade in raw cotton, with exports ranging between 1,477,000 and 2,546,000 bales per year and imports ranging between 628,000 and 1,184,000 bales over the past 10 years.

The USSR regularly exports cotton to some 20 countries of which, over the past 5 years, the seven largest accounted for about three-fourths of the total. In order of volume, the largest market for Soviet cotton was Poland, (which took an average of 404,000 bales per year during the 1967-71 period), followed by East Germany (376,000 bales), Czechoslovakia (279,000 bales), Japan (276,000 bales), Hungary (185,000 bales), Bulgaria (175,000 bales), and Romania (142,000 bales).

The USSR has imported cotton from some 11 to 15 countries in recent years. Egypt has been the leading source of imports (averaging 391,000 bales per year during the 1967-71 period), followed by Sudan (141,000 bales), Syria (123,000 bales), and Iran (84,000 bales). These four countries accounted for 84 percent of all imports.

Volume of trade, however, is not the only criterion for judging the importance of a country as either a source of cotton or as a market for cotton. For example, the volume of exports to some of the smaller cotton consuming nations may not be large in absolute terms but the volume obtained from the USSR has been a very real factor in the economy of countries such as Cuba, Finland, and North Korea. Similarly, the USSR as a customer for cotton has been valuable to producers like Afghanistan, Mali, and Morocco in much the same way as to the larger producers already mentioned. Any examination of the USSR's international trade in raw cotton suggests that decisions to buy or sell may be motivated by either economic or political considerations or both.

One aspect of the USSR's import pattern that has attracted considerable interest in cotton circles is the relatively large taking of extra-long staple cotton in view of its own sizable production of fine staple cotton, much of which would appear to be in the ELS staple range. For example, Egyptian export statistics indicate that, on the average, during the 5 years 1967-71, of the cotton exported to the USSR some 262,000 bales or roughly two bales out of three were ELS cotton. Similarly, over 90 percent of Sudan's exports to the USSR were ELS cotton and all of Morocco's small exports.

There is no available record of whether some of the ELS cotton imported is itself exported or whether the USSR exports some of its own fine staple production. Some years ago, numerous comments were made about the USSR's exporting Egyptian cotton into Western Europe, but there was a dearth of tangible evidence of such shipments. If for purposes

of this analysis it is assumed that some extra-long staple cotton of either domestic or foreign origin is exported by the USSR, it would still appear that the USSR's mill consumption of extra-long staple cotton is high when compared with other countries. Since one notices few textiles in the USSR that are obviously made from ELS cotton, one can but wonder whether the Soviet textile industry does more blending with ELS cotton than occurs in most other countries or whether certain products are made from fine staple cotton that in other countries would tend to be made from manmade fibers.

Table 34.–Exports of cotton from USSR, by country of destination, calendar year 1960-71

Country	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
	1,000 bales, 480 pounds net	*1,000 bales, 480 pounds net*	*1,000 bales, 480 pounds net*	*1,000 bales, 480 pounds net*	*1,000 bales, 480 pounds net*	*1,000 bales, 480 pounds net*	*1,000 bales, 480 pounds net*	*1,000 bales, 480 pounds net*	*1,000 bales, 480 pounds net*	*1,000 bales, 480 pounds net*	*1,000 bales, 480 pounds net*	*1,000 bales, 480 pounds net*
Algeria	0	0	0	0	0	0	5	5	0	0	0	0
Austria	23	24	40	35	22	29	28	14	15	11	7	4
Belgium	4	4	(1)	(1)	6	2	22	26	23	7	0	16
Bulgaria	83	85	91	89	122	143	178	141	166	173	214	181
Canada	0	0	0	0	1	43	53	99	67	24	4	0
Cuba	14	69	29	38	55	76	61	63	78	62	77	88
Czech	228	273	197	187	296	293	278	254	321	214	330	278
Finland	58	42	60	55	55	56	58	60	54	49	62	44
France	46	25	23	19	23	61	67	66	36	45	17	116
Germany, E.	396	382	428	356	362	393	380	363	360	320	452	383
Germany, W.	94	38	52	62	69	90	82	82	48	55	16	43
Hong Kong	0	0	0	0	0	0	10	0	0	0	0	0
Hungary	177	162	174	169	178	185	176	186	208	137	229	165
Italy	58	46	32	17	11	36	74	75	22	48	12	13
Japan	47	38	0	12	9	62	140	306	373	255	132	315
Korea, N.	9	46	47	43	38	47	45	46	61	46	53	53
Netherlands	4	0	6	(1)	12	7	8	10	6	0	0	5
Poland	353	344	255	251	378	365	413	348	371	347	473	480
Romania	143	134	124	125	135	137	139	144	135	127	151	153
Switzerland	3	5	5	0	0	1	3	4	0	0	0	0
United Kingdom	46	40	15	18	24	66	88	68	68	59	14	54
Vietnam, N.	0	0	0	0	9	9	0	14	14	14	14	14
Yugoslavia	5	0	0	0	0	0	24	79	112	69	97	67
Other countries	2	(1)	(1)	1	3	1	0	1	8	15	18	39
Total	1,793	1,757	1,578	1,477	1,808	2,102	2,332	2,454	2,546	2,077	2,372	2,511

[1] Less than 500 bales.

Source: "Foreign Trade of the USSR."

Table 35.—Imports of cotton into USSR by country of origin, calendar years 1960-71

Country	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
	1,000 bales, 480 pounds net	*1,000 bales, 480 pounds net*	*1,000 bales, 480 pounds net*	*1,000 bales 480 pounds net*	*1,000 bales, 480 pounds net*	*1,000 bales, 480 pounds net*	*1,000 bales, 480 pounds net*	*1,000 bales, 480 pounds net*	*1,000 bales, 480 pounds net*	*1,000 bales, 480 pounds net*	*1,000 bales, 480 pounds net*	*1,000 bales, 480 pounds net*
Afghanistan	27	32	43	55	71	65	42	49	30	11	16	25
Brazil	0	28	113	184	42	56	68	37	16	24	4	0
China, People's Rep. of	215	52	38	0	0	0	0	0	0	0	0	0
Egypt	510	422	311	457	346	492	452	328	273	294	564	497
Greece	9	13	36	31	31	23	29	23	32	37	48	4
Iran	39	33	32	43	52	33	29	51	63	114	93	99
Iraq	0	2	1	2	0	2	1	1	2	4	2	4
Mali	0	0	0	5	5	5	5	9	7	7	7	9
Mexico	13	1	14	40	0	0	0	0	0	0	0	0
Morocco	0	0	0	0	(1)	3	4	5	3	4	0	0
Nicaragua	0	0	0	14	0	0	0	0	0	0	0	0
Pakistan	0	0	0	28	0	5	9	24	21	35	52	28
Sudan	25	45	60	87	18	54	32	40	59	60	273	275
Syria	48	22	36	85	89	98	108	85	103	179	109	138
Turkey	0	0	0	0	5	2	5	9	11	13	8	34
Uganda	0	0	0	0	0	0	1	3	3	0	6	0
Yemen	0	0	3	3	3	2	6	0	4	1	0	0
Others	1	0	3	4	4	0	2	0	1	0	2	2
Total	887	650	690	1,038	666	840	793	664	628	783	1,184	1,115

[1] Less than 500 bales.

Source: "Foreign Trade of the USSR."

COTTON TEXTILE INDUSTRY AND FIBER CONSUMPTION

The USSR reached the position in 1970-71 of having the largest cotton consumption of any country in the world, followed by first the United States and then the People's Republic of China, according to reports of the United States Department of Agriculture.

The Soviet textile industry has grown at a fairly rapid rate. Active spindles increased from 10.8 million in 1960 to 14.6 million in 1970. Active looms increased from 225,000 to 278,000, and the composition shifted materially as automatic looms increased from 98,000 to 232,000 and ordinary looms shrank from 127,000 to 46,000. Cotton consumed on cotton equipment increased from 1.3 million metric tons in 1960 to 1.7 million in 1970. Meanwhile, manmade fibers consumed on the cotton spinning system increased from 135,000 metric tons to 309,000 and total fiber consumpiton in the industry from 1.5 million metric tons to 2.0 million metric tons. Cotton's share of the total dropped from 91 to 85 percent but this rate of decline in cotton's share is much smaller than in many other countries.

According to FAO, total per capita fiber availability in the Soviet Union in 1970 averaged 25.7 pounds per capita. This places it within the top 20 nations of the world in the per capita availability of cotton, wool, and manmade fibers combined. In addition to a high level of total per capita fiber availability, the trend has been definitely upward, having increased 26 percent between 1960 and 1970. Most of the increase occurred in the latter part of this period. Among the various fibers, per capita availability of cotton increased 11 percent—from 14.3 pounds to 15.9 pounds; wool was the same at 3.1 pounds in 1970 as in 1960, although it was lower in some of the period, while manmade fibers more than doubled. The largest percentage gains in manmade occurred in the noncellulosic fibers but the larger absolute gain occurred in cellulosic fiber, which in 1970 accounted for nearly three-fourths of the total for manmade fibers.

Table 36.–Cotton textile mill operating levels, USSR, 1960-70

Calendar year	Active spindles	Hours worked per active spindle	Active looms			Fiber consumption		
			Automatic	Ordinary	Total	Cotton	Man-made	Total
	Million	*Hours*	*Thousands*	*Thousands*	*Thousands*	*1,000 metric tons*	*1,000 metric tons*	*1,000 metric tons*
1960	10.8	NA	98	127	225	1,340	135	1,475
1961	10.8	NA	98	122	220	1,400	135	1,535
1962	11.4	NA	150	107	257	1,366	141	1,507
1963	11.6	5,347	155	107	262	1,319	190	1,509
1964	11.5	5,454	160	102	262	1,377	225	1,602
1965	12.3	5,484	170	79	249	1,450	263	1,713
1966	13.2	5,492	194	66	260	1,548	281	1,829
1967	14.0	5,500	214	52	266	1,606	261	1,867
1968	14.4	5,495	221	48	269	1,680	281	1,961
1969	14.5	5,525	227	45	272	1,719	285	2,004
1970	14.6	5,608	232	46	278	1,715	309	2,024

NA - Not available.

Compiled from International Cotton Industry Statistics, IFCATI.

Table 37.–Production of manmade fibers in USSR, calendar years 1960-71

Calendar year	Cellulosic			Noncellulosic			Total		
	Filament	Staple	Total	Filament	Staple	Total	Filament	Staple	Total
	Million pounds	*Million pounds*	*Million pounds*	*Million pounds*	*Million pounds*	*Million pounds*	*Million pounds*	*Million pounds*	*Million pounds*
1960	223.0	209.5	432.5	23.5	9.5	33.0	246.5	219.0	465.5
1961	231.0	269.0	500.0	33.5	18.5	52.0	264.5	287.5	552.0
1962	249.0	287.5	536.5	50.0	25.0	75.0	299.0	312.5	611.5
1963	290.0	296.0	586.0	61.0	33.0	94.0	351.0	329.0	680.0
1964	335.5	335.2	670.7	86.5	39.0	125.5	422.0	374.2	796.2
1965	362.9	364.3	727.2	119.5	51.4	170.9	482.4	415.7	898.1
1966	399.7	398.4	798.1	153.9	58.4	212.3	553.6	456.8	1,010.4
1967	422.9	448.0	870.9	187.9	67.5	255.4	610.8	515.5	1,126.3
1968	452.9	482.0	934.9	211.2	78.3	289.5	664.1	560.3	1,224.4
1969	480.2	491.6	971.8	227.5	86.2	313.7	707.7	577.8	1,285.5
1970	489.6	516.5	1,006.1	253.7	113.8	367.5	743.3	630.3	1,373.6
1971	507.0	535.0	1,042.0	291.0	156.0	447.0	798.0	691.0	1,489.0

Compiled from *Textile Organon.*

Table 38. Total and per capita availability of textile fibers, USSR, 1960-70

Calendar year	Cotton	Wool	Manmade fibers			All fibers
			Cellulosic	Noncellulosic	Total	
	Million pounds	*Million pounds*	*Million pounds*	*Million pounds*	*Million pounds*	*Million pounds*
Total fiber availability:						
1960	3,067.3	654.1	580.9	66.6	647.5	4,368.9
1961	3,017.7	607.4	716.5	80.0	796.5	4,421.6
1962	3,048.7	597.7	761.9	103.2	865.1	4,511.5
1963	3,151.5	590.4	765.7	136.9	902.6	4,644.5
1964	3,185.9	565.0	777.3	164.7	942.0	4,692.9
1965	3,323.9	585.5	844.6	211.6	1,056.2	4,965.6
1966	3,491.2	623.9	881.8	247.8	1,129.6	5,244.7
1967	3,632.5	659.2	981.5	295.4	1,276.9	5,568.6
1968	3,689.2	731.3	1,043.7	328.5	1,372.2	5,792.7
1969	3,752.7	720.7	1,079.2	371.7	1,450.9	5,924.3
1970	3,831.4	778.9	1,149.7	435.6	1,585.3	6,195.6
	Pounds per capita	*Pounds per capita*	*Pounds per capita*	*Pounds per capita*	*Pounds per capita*	*Pounds per capita*
Per capita availability:						
1960	14.3	3.1	2.7	0.3	3.0	20.4
1961	13.9	2.8	3.3	.4	3.7	20.4
1962	13.8	2.7	3.4	.5	3.9	20.4
1963	14.0	2.6	3.4	.6	4.0	20.6
1964	14.0	2.5	3.4	.7	4.1	20.6
1965	14.4	2.5	3.7	.9	4.6	21.5
1966	15.0	2.7	3.8	1.1	4.9	22.6
1967	15.4	2.8	4.2	1.2	5.4	23.6
1968	15.4	3.1	4.4	1.3	5.7	24.2
1969	15.7	3.1	4.4	1.5	5.9	24.7
1970	15.9	3.1	4.9	1.8	6.7	25.7

Source: Food and Agriculture Organization of the United Nations.

APPENDIX

Description of Soviet Cotton Varieties[1]

Upland Varieties

The "108-F" is the basic variety of medium-staple cotton in the Soviet Union. It occupies about 60 percent of all the plantings and its wide introduction is due to its high productivity, relative fast-ripening qualities, and good adaptability to various soil and climatic conditions.

The 108-F was developed from the initial 17637 variety at the "Pakhtalik-Kul" state farm and the Andizhan Regional Experimental Station by selectionist L.V. Rumshevich. It was introduced into the regional distribution system in 1947.

The 108-F variety ripens in 140-145 days but there may be variations depending on farming methods and zone and meteorological conditions (between 120 and 180 days). From 70 to 85 percent of the crop is picked before the advance of cold weather. The 108-F variety is highly resistant to wilt and well adapted to machine picking.

Technical properties of the fiber are:

Fiber output	percent	35-36
Length of fiber	mm	32.4
Metric Number		5500
Fiber strength	grams	4.7
Rupture length	km	26

The shape of the bush is pyramidal-compressed. The height of the main stalk is 100-120 cm and it is very stable. The first fruiting branch appears at the sixth-seventh node and the type of branching is I-II. The coloring of the stalk is green with reddish-brown tint; pubescence slight; density of the leaves, medium; the cotton bolls—big sized, eggshaped, with a bent tip

[1]Adapted from English language folio entitled "Cotton Varieties of Uzbekistan," Tashkent, 1966.

and well pronounced star. The weight of the lint and seed within one boll is 6.5-7 grams. The seed is pubescent and the fuzz of light grey color.

Soviet cotton variety "S-4727" is grown mainly in the northern regions of the cotton belt. One of its most advantageous properties is its fast ripening. It is ready for harvesting 8-10 days earlier than the 108-F variety. In Uzbekistan the S-4727 variety is sown mainly on the territory of the Karakalpak Autonomous Republic and the foothills of Tashkent and Samarkand regions. It is also widely sown in Azerbaidzhan and the Chimkent region of the Kazakh Republic.

The S-4727 variety was developed by B.P. Straumal and A.I. Tishin of the Cotton Selection and Seed Research Institute in cooperation with A.Y. Kuznetsova, seed breeder of the "Akkurgan" No. 1 state farm as a cross between the 137-F and S-1470 varieties. It was introduced into regional distribution in 1961.

The variety underwent state trials in 1955 and according to available data, its yields are higher than those of the 108-F variety: prior to the cold period—by 5-25 percent, total yield—by 5-10 percent. Fiber output is higher by 2-3 percent. The cotton bolls are large and the weight 6.2-6.7 grams.

The S-4727 variety is well adapted to machine picking. It is slightly inferior to the 108-F variety in wilt resistance and is therefore recommended for use in districts less affected by this disease.

Technical properties of the "S-4727" variety are:

Fiber output	percent	37-38
Length of fiber	mm	32.6
Metric number		5610
Fiber strength	grams	4.6
Rupture length	km	26

The shape of the bush is pyramidal-compressed. The height of the main stalk is 90-110 cm. The first fruiting branch appears at the fifth-sixth node. Type of branching is I-1½. The color of the stalks is green with a brownish tint. There is a slight pubescence and the density of the leaves is medium. The leaves are not very large, green in color with an opaque surface. The shape of the middle section of the leaf is triangular. The bolls are large and ball-shaped without tips and star. The seed is pubescent and the fuzz is of a light-color.

Soviet "153-F" variety was developed at the

cent) and has high resistance to wilt. A very valuable property of this variety is its denuded seed which bears no fuzz. This makes it possible to use precision drills and sow a given number of seed without additional expenses for seed denudation. The variety was recommended for regional distribution in 1964.

Technical properties of the 153-F variety are:

Fiber output	percent	39-40
Length of fiber	mm	32.4
Metric number		5000
Fiber strength	grams	4.9
Rupture length	km	24

The shape of the bush is pyramidal-compressed. The height of the main stalk is 90-110 cm. The first fruiting branch appears at the sixth-seventh node. The type of branching is I-II. The color of the stalk is green with a brown tint and there is no pubescence on the stalk. The density of the leaves is very high and the leaves are large, light-green with a luster. The shape of the middle section of the leaf is a rounded triangle. The bolls are of medium size, rounded with a small tip without a star. The weight of the lint and seed within the boll is 5.9-6.4 grams. The seeds are denuded, with a small growth on the micropylar section. This variety is well adapted for cotton picking.

The Soviet variety "133" combines high productivity with high technical qualities of the fiber. From the morphological point of view this is a typical Soviet cotton variety, whereas the quality of the fiber brings it close to the 5904-I fine-staple variety which belongs to type 3. Variety 133 is extremely fast-ripening and yields more than the 5904-I variety. It was developed at the elite growing farm No. 8 by selectioner E.I. Arkatova and is a cross between the 138-F and S-5405 varieties. Variety 133 has been undergoing state trials since 1961 and is propagated in Surkhandarya region of Uzbekistan and the Turkmen Republic zones set aside for fine-staple cotton.

The growing period of variety 133 is 143-148 days and it ripens 6-7 days earlier than the variety 5904-I. It is superior to the latter in fiber output by 25-30 percent and the yields are higher by 30-40 percent. As compared with the 108-F variety, it ripens 1-2 days later and is inferior to the latter in yields (8-10 percent) and in fiber output (15-18 percent). The 133 variety is fully resistant to Fusarium wilt and has moderate resistance to other types of wilt.

Technical properties of the fiber are:

Fiber output	percent	31-32
Length of fiber	mm	36.8
Metric number		6400
Fiber strength	grams	4.9
Rupture length	km	31.4

The shape of bush is pyramidal-compressed. The ieight of the main stalk is 90-110 cm. The first 'uiting branch appears at the sixth-seventh node and he type of branching is I-II. The stalks are green with i red-brownish tint. Pubescence and leaf density are noderate. The leaves are medium-sized of a dark green color. The shape of the middle section of the eaf is triangular. The cotton boll is not large, oval-shaped with tip but without a star. The weight of the int and seed in one boll is 5.5-6.3 grams. The seed is pubescent with a light-grey fuzz.

The 133 variety is highly sensitive to growing conditions, particularly to irrigation. If the water supply s inadequate the fiber becomes coarse and loses both length and metric number.

The Soviet cotton variety "138-F" is the basic variety grown in Surkhandarya Region of Uzbekistan and the Turkmen Republic. In this zone, the 138-F variety yields 5-10 percent more cotton than the 108-F variety, although it ripens 1-2 days later than the latter.

The variety was developed by L.V. Rumshevich and N.A. Tolusheva at the Andizhan Regional Experimental Station of the USSR Cotton Research Institute. It was selected from the generations of the natural hybrid 2034 and underwent regional distribution in 1952.

The 138-F variety is somewhat inferior to 108-F in wilt resistance and adaptability to machine picking is medium.

The fiber holds intermediary position between type 4 and 5 and has the following indices:

Fiber output	percent	36-37
Length of fiber	mm	35.7
Metric number		5910
Fiber strength	grams	4.5
Rupture length	km	26.6

The fiber of the 138-F variety is 3-4 mm longer and 500-600 numbers thinner than that of the 108-F. However, in view of the lower strength index the 138-F variety fiber cannot be used as type 4.

The shape of the bush is broadly pyramidal. The height of the main stalk is 100-120 cm and the first fruiting branch appears on the sixth-seventh node. Type of the fruiting branches is II. The stalk is stable and is green with a reddish-brown tint. The pubescence is poor and the density of the leaves is high. The leaves are large of a dark-green color and the shape of the middle section of the leaf is triangular. The cotton bolls are large, oval-shaped with a tip and star. The weight of the lint and seed in one boll is 6.5-7 grams. The seed is pubescent with a long light grey fuzz.

The Soviet variety "149-F" is one which meets the requirements of the textile industry in thin and long fibers. Its fiber belongs to type 4 and that is why the procurement price for this variety is 10 percent higher than for the 108-F. It is used for the manufacture of high-quality textiles—chiffon, satin, poplin, etc., and also durable industrial textiles.

The 149-F variety was developed at the Andizhan Regional Experimental Station of the USSR Cotton Research Institute by L.A. Turks and V.Y. Butkova through selection from generations of the natural hybrid of 108-F. It was distributed on a regional basis in 1960. This variety is grown in Uzbekistan, Turkmenistan, Tadzhikistan, and Kirgizia in zones of reliable irrigation. It ripens faster than 108-F by 2-3 days and due to this its yield prior to frosts is 5-10 percent higher, whereas the total yield is on the same level with 108-F.

Technical properties of the fiber are:

Fiber output	percent	36-37
Length of fiber	mm	35
Metric number		5150
Rupture length	km	26.4

The shape of the bush if pyramidal-compressed. The height of the main stalk is 90-100 cm. The first fruiting branch appears on fifth-sixth node and the type of branching is I-II. The color of the stalks is green with yellowish-brownish tint. Pubescence on the stalks is medium and leaf density is also medium. The leaves are small, green with an opaque surface. The middle section of the leaf is round-elongated. The bolls are large with a small star. The weight of the lint and seed within each boll is 6.7-7.2 grams. The seed carries a light grey fuzz.

Fine-Staple Varieties

The "5904-I" variety is the most fast ripening of all Soviet fine-staple cotton varieties, and is also marked for its high productivity. Within its zone, this variety ripens in 140-150 days. It was developed at the Iolotan Selection Center of the Turkmen Soil Husbandry Research Institute by selectioner K.I. Tsinda through repeated selection from the hybrid generations of the 1201-I and 3159-I cross. It was introduced into regional distribution in 1953.

The quality of the fiber, though it is of the fine-staple variety, is comparatively poor. However, the high yields of this variety combined with good output of fiber retains it on up to 50,000 hectares. Resistance to wilt is poor.

The fiber of the 5904-I variety is of type 3 and has the following indices:

Fiber output	percent	34-35
Length of fiber	mm	36.2
Metric number		5800
Fiber strength	grams	5.4
Rupture length	km	31.6

The bush is column-shaped and the height of the main stalk is 100-140 cm. The first fruiting branch appears on the fourth-fifth nodes. The type of branching is extreme (0).

The stalk is green with a brown tint without pubescence. The density of the leaves is low. They are large, green and the shape of the middle section is an elongated triangle. The cotton bolls are medium-sized, rounded egg-shaped, with tips but no star. The surface of the cotton bolls is porous. The weight of the lint and seed of one boll is 3.2-3.4 grams. The seed is almost fully denuded with a small fuzz growth on the micropyle of a light grey color with green streaks.

The "5595-V" variety was developed at the Vakhsh Experimental Station by selectioner V.P. Krasichkov from a hybrid generation of the cross between 5476-I and 2525. It is the leading fine-staple variety in the Tadzhik Republic and was given regional distribution in 1963.

The 5595-V variety ripens 2-3 days later than the 5904-I variety or simultaneously. However, it yields 10-12 percent more and fiber output is also 8-10 percent higher. The variety is relatively stable against wilt and macrosporiosis. The fiber is of type 2 and has the following indices:

Fiber output	percent	30-32
Length of fiber	mm	37.2
Metric number		6960
Fiber strength	grams	4.8
Rupture length	km	33.4

The bush is cone-shaped and the height of the main stalk is 90-120 cm. The first fruiting branch appears at the fourth-fifth node and the type of branching is extreme(0). Leaf density is low. The cotton bolls are medium-sized, cone-shaped with tips but no stars. The weight of the lint and seed in one boll is 3.2-3.4 grams. The seed carries greyish-green fuzz but denuded in spots.

The "9078-I" is the basic fine-staple variety in the Turkmen Republic. It was developed at the Iolotan Selection Centre by selectioner I.K. Makhimenko from hybrid generations of the cross between the 8090-I and 5476-I varieties. It was introduced into regional distribution in 1962.

The 9078-I variety is relatively late ripening and is resistant to wilt. The fiber is of type 2 and has the following indices:

Fiber output	percent	33-35
Length of fiber	mm	37.3
Metric number		7500
Fiber strength	grams	4.5
Rupture length	km	33.3

The bushes are compact, ball-shaped. The height of the main stalk is 100-120 cm. The first fruiting branch is at the fifth-sixth nodes. The type of branching is II-III. The stalk is green with a brownish tint and denuded. Leaf density is moderate. The leaves are medium-sized, green and the shape of the middle section is an elongated triangle. The cotton bolls are of medium size, rounded cones with tips but without stars. The weight of the lint and seed in one boll is 3-3.4 grams. The seed is almost fully denuded save for a small greyish-green fuzz on the micropyle section.